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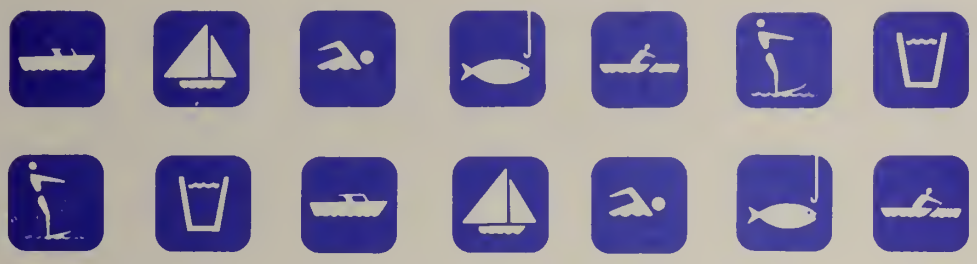

1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

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STAUNTON SPORTSMAN CLUB LAKE
MACOUPIN CO.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

STAUNTON SPORTSMEN'S CLUB LAKE, MACOUPIN COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

This is one of 87 reports prepared for lakes in the 1981 Volunteer Lake Monitoring Program. It represents the coordinated effort of many individuals.

Illinois EPA's Ambient Monitoring Unit, Planning Section, Division of Water Pollution Control, under the direction of Kenneth R. Rogers, was responsible for the design and implementation of the program, as well as preparation of this report. Substantial assistance was provided by the Agency's Public Participation Section supervised by Gloria Craven.

Program coordination was provided by Donna Sefton for the Illinois EPA's Ambient Monitoring Unit and Carol Beim for the Public Participation Section.

Volunteers were trained by Public Participation Coordinators Carol Beim, Bob Hagele, William Hammel, Patrick McCarthy, Vanessa Musgrave, and Dawn Wrobel. Lake maps were prepared by J. W. Hammel and Bob Hagele. Lake assessment summaries were prepared by Patrick McCarthy.

Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

Donna Sefton, Howard Essig, John Little, John Lesnak, Carol Beim, and Bob Hagele wrote portions of the lake reports. Reports were edited by Planning Section and Public Participation staff, particularly Marilyn Budd and Mary Anderson. The contributions of Robert Clarke and Thomas Davenport are recognized.

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Staunton Sportsman's Club Lake is a 9 acre impoundment owned by Staunton Sportsman's Club, a non-profit organization. It is located approximately 3 miles northeast of Staunton, Illinois. The impoundment was constructed in 1903 by damming a railroad ditch. Water leaving the lake flows over coal slag sediment before entering Cahokia Creek. The lake has a maximum depth of 13 feet, an average depth of 9 feet, and storage capacity of 81 acre-feet (Table 1).

Staunton Sportsman's Club Lake serves as a recreational lake used for fishing, rowboating, canoeing, camping, picnicking, and waterfowl observation. Access is only through club-owned property, and is intended for organization members and their invited guests.

The 150 acre watershed of Staunton Sportsman's Club Lake is estimated to be 45 percent row crops. The lake shoreline is primarily wooded.

Algal blooms are considered to be a moderate problem for Staunton Sportsman's Club Lake. Pasture, grassland and cropland runoff, and mining waste are cited as potential sources of pollution. In 1968, the lake was completely killed off by coal slag runoff water. A drainage

TABLE 1. LAKE ASSESSMENT SUMMARY, STAUNTON SPORTSMAN'S CLUB LAKE, MACOUPIN COUNTY, ILLINOIS (RJ-A02-P).

I. GENERAL INFORMATION

River Basin: Miss. South Central
Segment: A02
Latitude:
Longitude:
Ownership: Staunton Sportsman Club

Surface Area (Acres): 9
Watershed Area (Acres): 150
Maximum Depth (Feet): 13
Average Depth (Feet): 9
Storage Capacity (Acre/Feet): 81
Inflowing Stream(s): Railroad ditch
Outflowing Stream(s): Cahokia Creek
Water Retention Time:
Lake Type: dammed stream
Year Constructed: 1903

II. USAGE

Public Access: No-organization members & guests only
Lake Usage:
- Potable Water Supply: none
- Industrial Water Supply: none
- Agricultural Water Supply: light
- Cooling Water: none
- Recreation:
  - Fishing: moderate
  - Swimming: none
  - Power Boating: none
  - Row Boating or Canoeing: moderate
  - Sailboating: none
  - Camping: light
  - Picnicking: light
  - Waterfowl Hunting: none
  - Waterfowl Observation: light
  - Other:

Recreational Facilities:
Picnic areas, covered pavillion, camping areas.

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns):
- Golf Courses:
- Pasture or Grassland: 25%
- Woodland: 73%
- Row Crops:
- Wetland: 2%
- Other:

Watershed Usage (Percent):
- Urban:
- Residential:
- Golf Courses:
- Pasture or Grassland: 15%
- Woodland: 40%
- Row Crops: 45%
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: good
Conditions and Extent:
- Suspended Sediment: minimal
- Deposition of Sediment: slight
- Algal Blooms: moderate
- Aquatic Weeds: slight
- Taste and/or Odor: minimal
- Water Level Fluctuation: minimal
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks:
- Pasture or Grassland Runoff: yes
- Cropland Runoff: yes
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining: yes
- Waterfowl:
- Sediment in Lake:
- Other:

V. LAKE MANAGEMENT

Comments: In 1968 lake was completely killed off by coal slag runoff water. A drainage tile was illegally opened, which diverted runoff into the lake. Now lake neutralized and restocked. Copper Sulfate to control algal growth.

Information Supplied By Ronald M. Heigert (1981)

tile was illegally opened, which diverted the runoff into the lake killing the entire aquatic population, except for mosquitos. Since that time, the tile has silted shut and the acid runoff has stopped. The lake has neutralized, and fish have been stocked. Currently, the fish and vegetative populations are abundant.

Assessment and monitoring information for Staunton Sportsman's Club Lake was provided by Ronald M. Heigert, a trustee of the Club. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Figure 1) on five dates in 1981: May 15 and 22, June 7 and 26 and September 27, 1981.

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report, "Volunteer Lake Monitoring, 1981", Section IV, "Understanding Illinois' Lakes".

The Secchi monitoring data for Staunton Sportsman's Club Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Staunton Sportsman's Club Lake

The average Secchi disc transparency of Staunton Sportsman's Club Lake was 45 inches, which ranked number 33 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976). However, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Staunton Sportsman's Club Lake ranged from a minimum of 24 inches at Site 3 from June 15 through September 27 to a maximum of 96 inches at Site 1 on September 27.

Differences in clarity were evident in different sections of Staunton Sportsman's Club Lake. Transparency averaged 61.2 inches, 51.0 inches, and 24.0 inches at Sites 1, 2, and 3 respectively. The differences in the Secchi readings were probably related in part to the total depths of the sites, which averaged 11.8 feet at Site 1, 6.0 feet at Site 2 and 2.0 feet at Site 3. The Secchi could be seen to the bottom at Site 3.

FIGURE 1

STAUNTON SPORTSMAN'S CLUB LAKE

MACOUPIN COUNTY

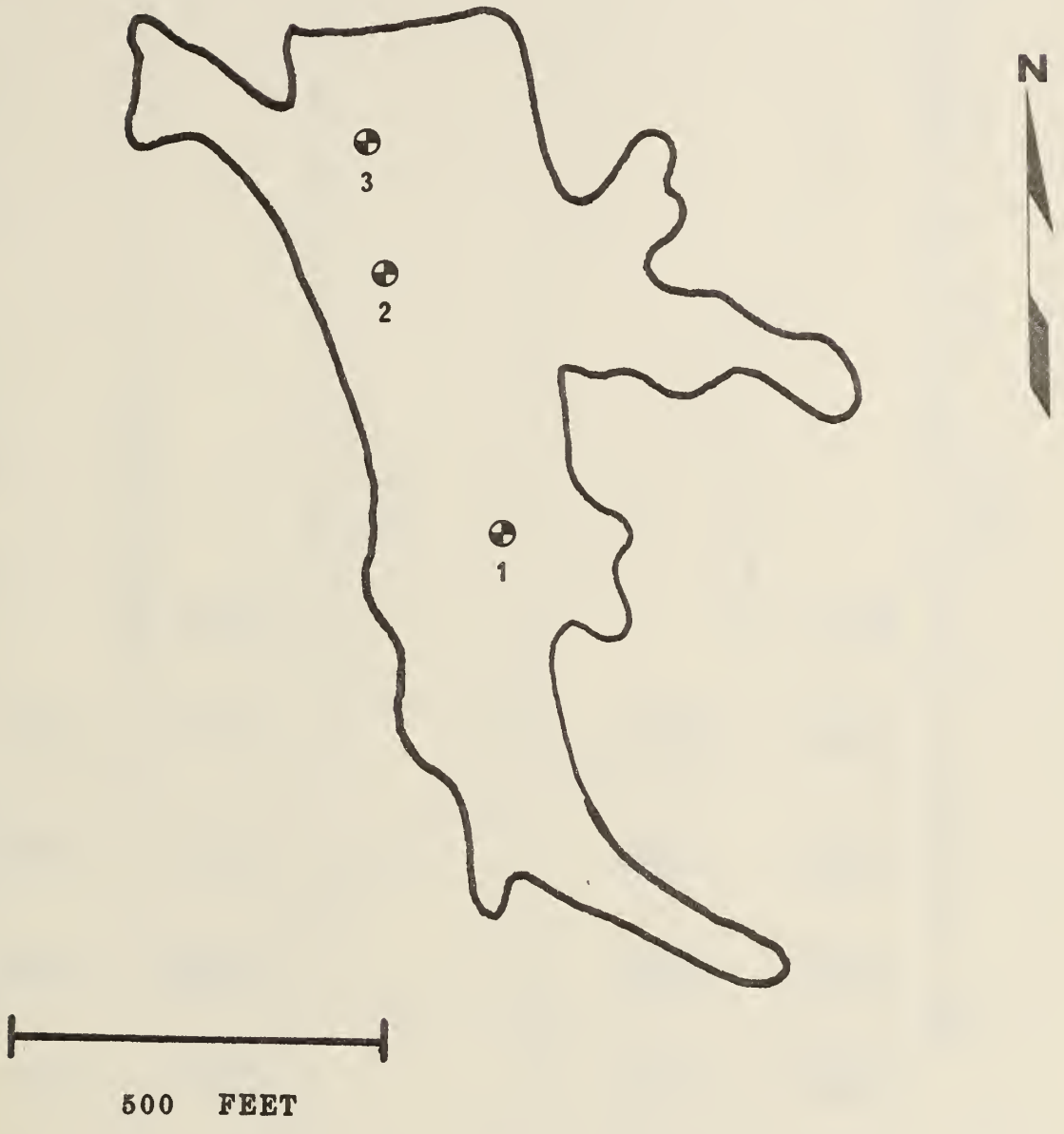


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) STAUNTON S.C./MACOUPIN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 15	60.0	54.0	24.0	46.0	19.3
05/ 22	42.0	-1.0	24.0	33.0	12.7
06/ 7	48.0	48.0	24.0	40.0	13.9
06/ 26	60.0	48.0	24.0	44.0	18.3
09/ 27	96.0	54.0	24.0	58.0	36.2

SUMMARY STATISTICS

	SITES			LAKE
MEAN	61.2	51.0	24.0	45.0
STD DEV	21.0	3.5	0.0	20.5
MIN	42.0	48.0	24.0	24.0
MAX	96.0	54.0	24.0	96.0
AV DEPTH	11.0	6.0	2.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) STAUNTON S.C./MACOUPIN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 15	11.0	6.0	2.0	6.3	4.5
05/ 22	11.0	-1.0	2.0	6.5	6.4
06/ 7	13.0	6.0	2.0	7.0	5.6
06/ 26	13.0	6.0	2.0	7.0	5.6
09/ 27	11.0	6.0	2.0	6.3	4.5

SUMMARY STATISTICS

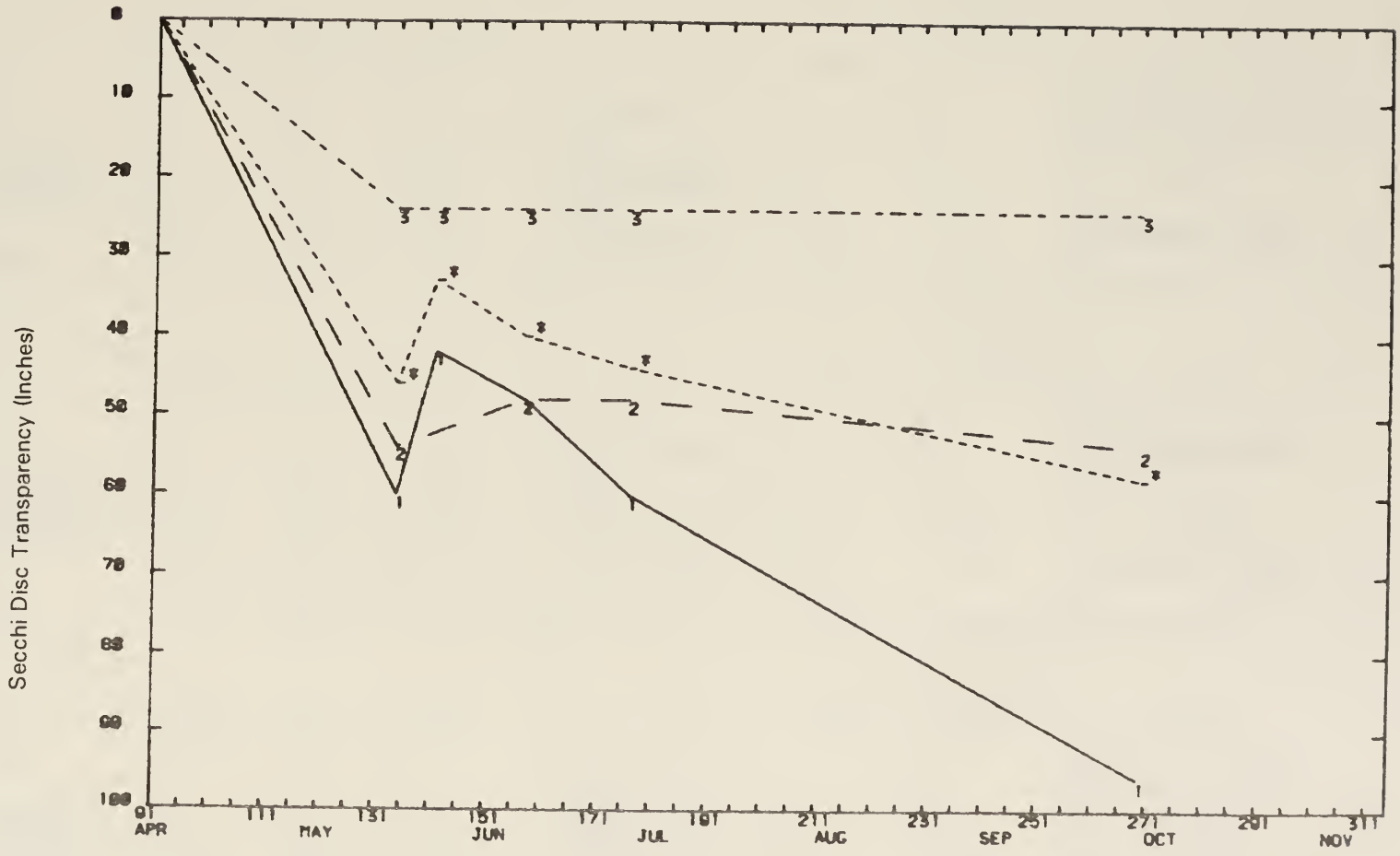
	SITES			LAKE
MEAN	11.0	8.0	2.0	6.6
STD DEV	1.1	0.0	0.0	4.4
MIN	11.0	6.0	2.0	2.0
MAX	13.0	6.0	2.0	13.0
AV DEPTH	11.0	6.0	2.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) STAUNTON S.C./MACOUPIN COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



Day of Year

KEY

1 Site 1
2 Site 2
3 Site 3
* Mean (Average)

TABLE 4. FIELD OBSERVATIONS, STAUNTON SPORTSMAN'S CLUB, MACOUPIN COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/15/81	WATER COLOR:	lt. brown	lt. brown	lt. brown
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	moderate
	WEEDS NEAR SHORE:	minimal	minimal	large
	OTHER SUBSTANCES:	*	*	*
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	overcast
PRECIPITATION:	no rain	heavy rain
WAVES:	calm	ripple
AIR TEMPERATURE:	warm	cool
WIND DIRECTION:	NW	N
OBSERVATIONS MADE BY:	Ron Heigert	

OTHER COMMENTS
WATER LEVEL OF LAKE:
RECREATIONAL USAGE: none
LAKE MANAGEMENT: none
ADDITIONAL COMMENTS:

*milkweed or cottonwood fuzz

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/22/81	WATER COLOR:	brnsh-grn	brnsh-grn	mod. brown
	SEDIMENT:	minimal	minimal	moderate
	ALGAE:	minimal	minimal	large
	WEEDS AT SAMPLE SITE:	minimal	slight	moderate
	WEEDS NEAR SHORE:	minimal	minimal	large
	OTHER SUBSTANCES:	none	none	leaves *
	ODOR:	no odor	no odor	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	SW	SW
OBSERVATIONS MADE BY:	Ron Heigert	

OTHER COMMENTS
WATER LEVEL OF LAKE: above normal 2"
RECREATIONAL USAGE: none
LAKE MANAGEMENT: none
ADDITIONAL COMMENTS:

*algal mats, algal col.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/7/81	WATER COLOR:	grn-brn	grn-brn	blackish
	SEDIMENT:	minimal	minimal	moderate
	ALGAE:	minimal	minimal	large
	WEEDS AT SAMPLE SITE:	minimal	minimal	moderate
	WEEDS NEAR SHORE:	slight	slight	large
	OTHER SUBSTANCES:	none	none	dead fish * oil films
	ODOR:	no odor	no odor	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	hazy
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SE	SE
OBSERVATIONS MADE BY:	Ron Heigert	

OTHER COMMENTS
WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: none
LAKE MANAGEMENT: 5/31/81 125 lbs. copper sulfate to retard algae growth
ADDITIONAL COMMENTS: 6/4/81-fish poison to kill small fish. Rotenone administered by Conservation Dept.

*algal mats, algal col., sediment

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/26/81	WATER COLOR;	grnsh-brn	lt. green	mod. green
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:	minimal	minimal	slight
	WEEDS NEAR SHORE:	minimal	minimal	moderate
	OTHER SUBSTANCES:	none	none	lily pads
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SW	SW
OBSERVATIONS MADE BY:	Ron Heigert	

OTHER COMMENTS
WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing
LAKE MANAGEMENT: none
ADDITIONAL COMMENTS:

TABLE 4. WEED OBSERVATIONS, STARVED ROCK STATE PARK, LASALLE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/27/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	clear	hazy	WATER LEVEL OF LAKE: below normal 2"
	SEDIMENT:	minimal	slight	slight	PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE: none
	ALGAE:	minimal	large	large	WAVES:	ripple	small	
	WEEDS AT SAMPLE SITE:	minimal	large	large	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	large	large	WIND DIRECTION:	N	SW	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	algal mats	algal mats				
			*algal col.	*algal col.	OBSERVATIONS MADE BY:	Ron Heigert		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	musty				

*duckweed

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
					OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:
	ODOR:							

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
					OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:
	ODOR:							

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR;				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
					OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:
	ODOR:							

Since Secchi measurements were not taken in July, August and October, seasonal differences in the transparency of Staunton Sportsman's Club Lake cannot be completely described. The lowest transparencies were found in late spring, and were probably the result of increased amounts of suspended sediment caused by heavy rains which fell prior to sampling.

Field observations indicate that the transparency of Staunton Sportsman's Club Lake is influenced primarily by the presence of algae. A greenish water color was noted, with algal colonies observed on several sampling dates. Copper sulfate was used for algal control. Aquatic weeds and algae were noted as abundant at Site 3. This may reflect the shallow nature of the site and/or nutrient input in that vicinity.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone for Staunton Sportsman's Club Lake (estimated at twice the Secchi depth) ranged from 7.0-16.0 feet at Site 1, from 8.0-9.0 feet at Site 2, and was 2.0 feet at Site 3. Since Site 1 was deep enough to thermally stratify and had an euphotic zone that was generally less than the total site depth, low dissolved oxygen may be expected in the bottom waters of Site 1.

In the absence of dissolved oxygen, substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When the substances which have accumulated in the bottom waters during stratification periods are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Staunton Sportsman's Club Lake, a small organizationally-owned recreational impoundment in central Illinois, was sampled on five dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer

Lake Monitoring Program. Volunteer Ronald Heigert recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average transparency of Staunton Sportsman's Club Lake was 45 inches, which ranked 33rd of the lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). Although this average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health, it was in the normal range for Illinois lakes and was compatible with most recreational uses.

Lowest transparencies were recorded in late spring, and were probably the result of increased amounts of suspended sediment caused by heavy rainfall prior to sampling. The transparency of Staunton Sportsman's Club Lake on other dates was influenced primarily by algae as evidenced by observations of green water color, algal colonies, and use of copper sulfate for algal control.

Site 1 on Staunton Sportsman's Club Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Staunton Sportsman's Club Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment inputs were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Information of lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Continued monitoring is also recommended for Staunton Sportsman's Club Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake watershed management strategies.

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DS:jab/sp3891C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

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pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

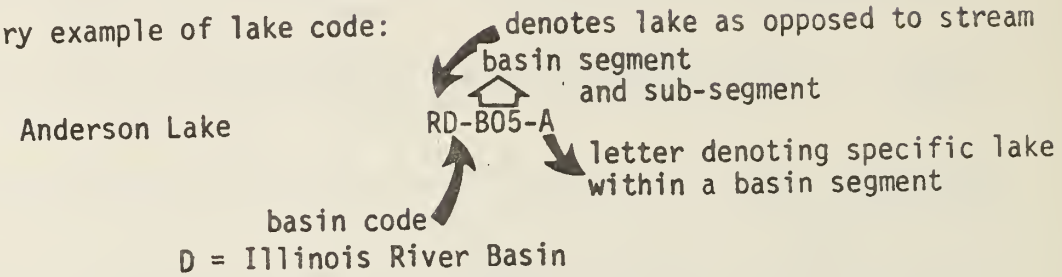
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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MONITORING PROGRAM REPORT

STANBERRY LAKE | FAYETTE Co.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

STANBERRY LAKE, FAYETTE COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have available a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Stanberry Lake is a 12 acre impoundment located in Fayette County, 5 miles southeast of Vandalia, Illinois. It is owned by Tenshore, Inc. The lake, which was constructed by damming an unnamed stream in 1945, has a maximum depth of 10 feet, an average depth of 5 feet and a storage capacity of 60 acre-feet (Table 1).

Stanberry Lake serves as a recreational lake used primarily for fishing, rowboating and canoeing. Swimming, powerboating and waterskiing are not allowed. Access is available to organization members and their guests.

The 300 acre watershed of Stanberry Lake is estimated to be 90 percent row crops. The lake shoreline is primarily woodland.

Suspended sediment, deposition of sediment and water level fluctuation are considered moderate problems for the lake. Cropland runoff and waterfowl are cited as potential pollution sources.

Assessment information on Stanberry Lake was provided by Walter Horsthemke, Lake Manager. Monitoring was performed by Walter Horsthemke and Harry Walton. Secchi disc transparency, total depth, and field observations were recorded at three sites (located in Fig. 1) on May 24, 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, STANBERRY LAKE, FAYETTE COUNTY, ILLINOIS (RO-B03ZE).

I. GENERAL INFORMATION

River Basin: Kaskaskia
Segment: B03

Ownership: Tenshore Inc,

Surface Area (Acres): 12
Watershed Area (Acres): 300
Maximum Depth (Feet): 10
Average Depth (Feet): 5
Storage Capacity (Acre/Feet): 60
Inflowing Stream(s): not named
Outflowing Stream(s): not named
Water Retention Time:
Lake Type: dammed stream
Year Constructed: 1945

II. USAGE

Public Access: no, organization members & guests only
Lake Usage:
- Potable Water Supply: none
- Industrial Water Supply: none
- Agricultural Water Supply: none
- Cooling Water: none
- Recreation: moderate
  - Fishing: moderate
  - Swimming: not allowed
  - Power Boating: not allowed
  - Row Boating or Canoeing: moderate
  - Sailboating: none
  - Camping: none
  - Picnicking: none
  - Waterfowl Hunting: none
  - Waterfowl Observation: none
  - Other:

Recreational Facilities:
owner owned docks

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns):
- Golf Courses:
- Pasture or Grassland:
- Woodland: 85%
- Row Crops:
- Wetland:
- Other: Cabin Frontage 15%

Watershed Usage (Percent):
- Urban:
- Residential:
- Golf Courses:
- Pasture or Grassland:
- Woodland: 10
- Row Crops: 90
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
Fishing: fair
Conditions and Extent: moderate
- Suspended Sediment: moderate
- Deposition of Sediment: moderate
- Algal Blooms: minimal
- Aquatic Weeds: minimal
- Taste and/or Odor: slight
- Water Level Fluctuation: moderate
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks:
- Pasture or Grassland Runoff:
- Cropland Runoff: yes
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl: yes
- Sediment in Lake:
- Other:

V. LAKE MANAGEMENT

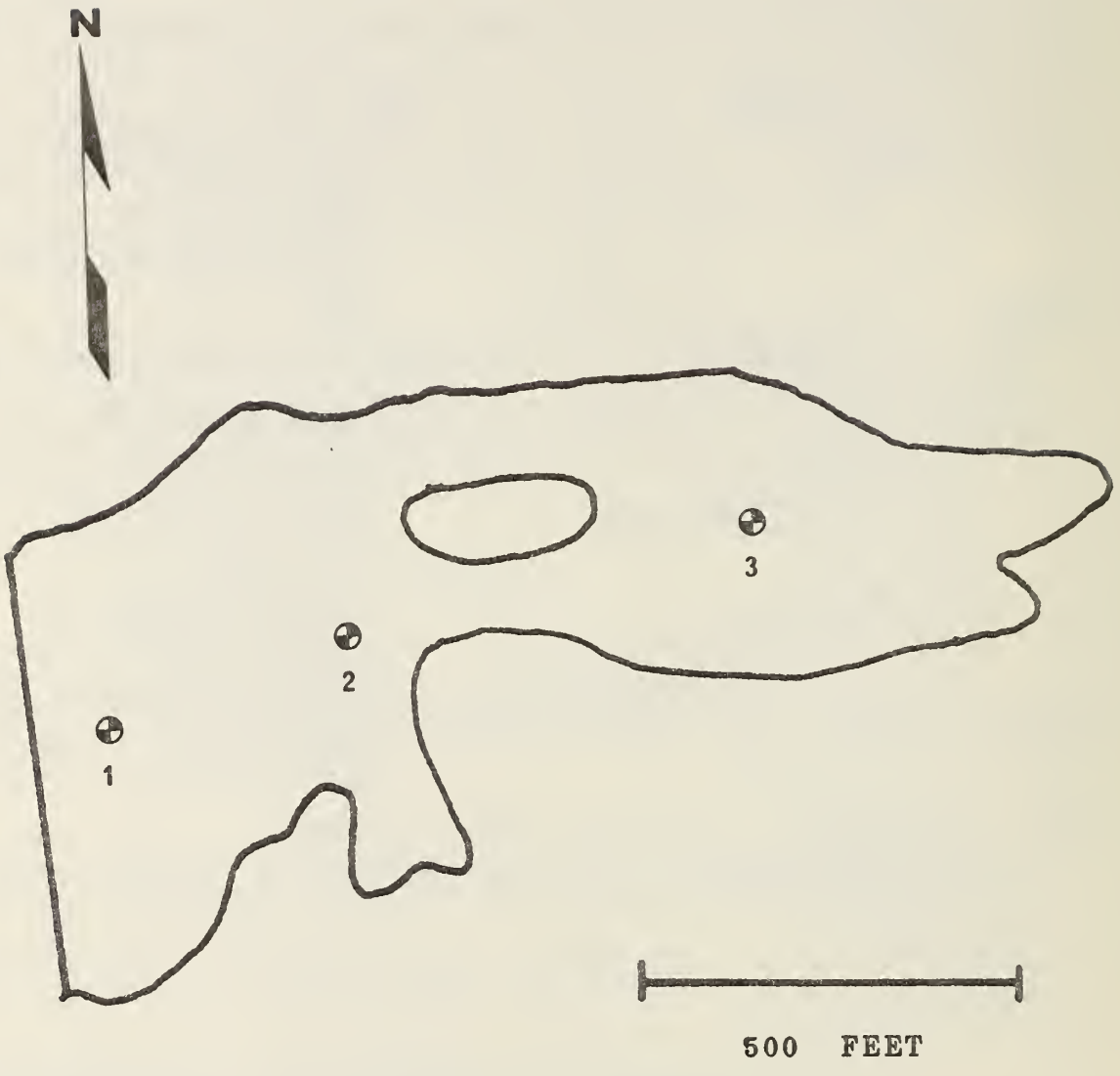
Comments:

Information Supplied By Walter Horsthemke(1981).

FIGURE 1

STANBERRY LAKE

FAYETTE COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Stanberry Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Stanberry Lake

Secchi disc measurements for Stanberry Lake were taken only on May 24. The readings were 10 inches at all three sites. The average transparency of 10 inches ranked number 80 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems for Illinois lakes.

Spatial and Seasonal Differences in Transparency

Since there was only one sampling date (May 24) spatial and seasonal trends of transparency could not be determined. The low Secchi reading of 10 inches at the sites were probably related, in part, to the shallow depths (average depth 5.7 feet) which allowed wind and wave activity to stir up the sediment. A greenish-brown water color also indicated the presence of algae.

Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) STANBERRY/FAYETTE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 4	10.0	10.0	10.0	10.0	0.0

SUMMARY STATISTICS

	SITES			LAKE
MEAN	10.0	10.0	10.0	10.0
STD DEV	-1.0	-1.0	-1.0	0.0
MIN	10.0	10.0	10.0	10.0
MAX	10.0	10.0	10.0	10.0
AV DEPTH	8.5	5.5	3.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) STANBERRY/FAYETTE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 4	8.5	5.5	3.0	5.7	2.8

SUMMARY STATISTICS

	SITES			LAKE
MEAN	8.5	5.5	3.0	5.7
STD DEV	-1.0	-1.0	-1.0	2.8
MIN	8.5	5.5	3.0	3.0
MAX	8.5	5.5	3.0	8.5
AV DEPTH	8.5	5.5	3.0	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) STANBERRY/FAYETTE COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

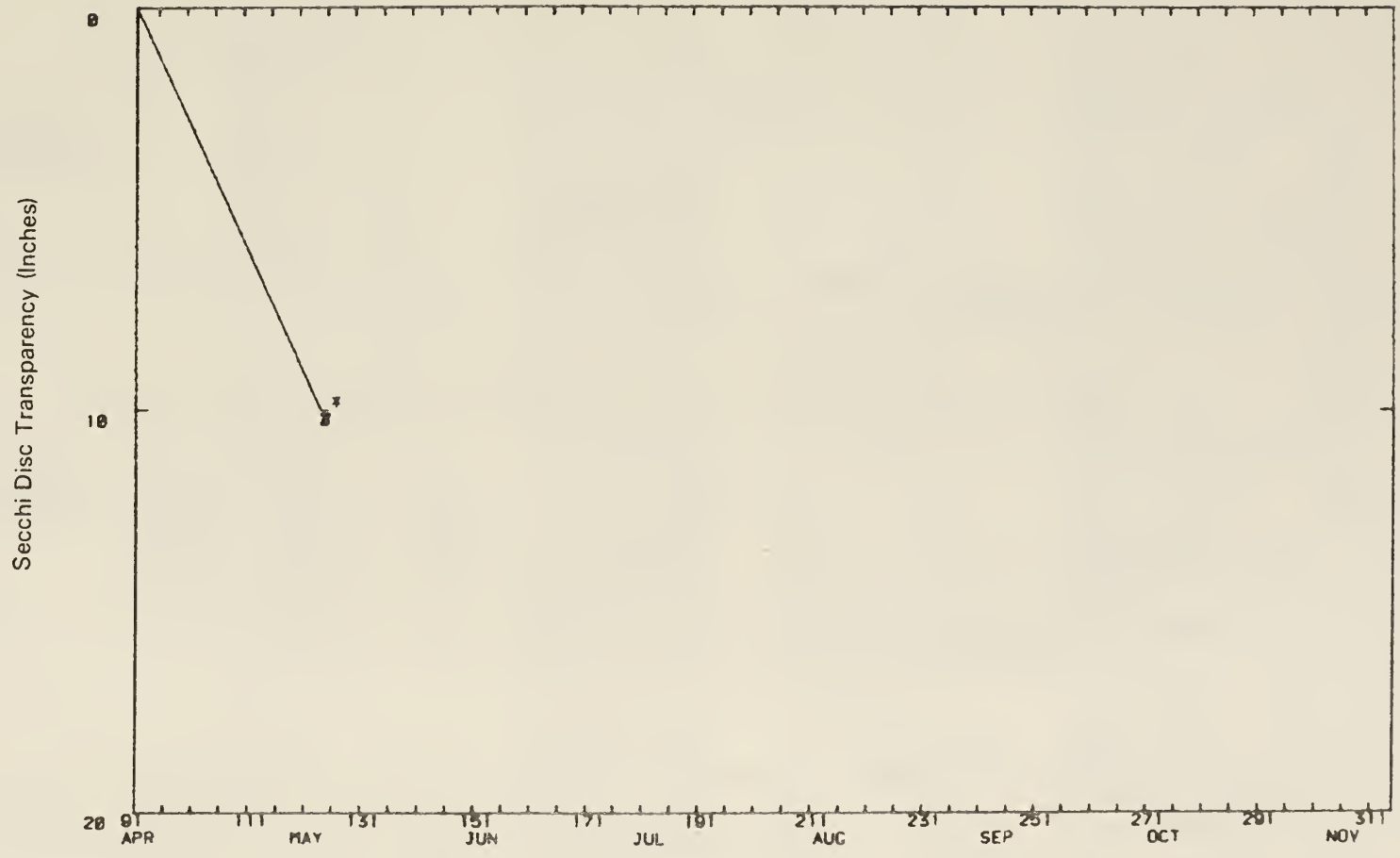


TABLE 4. FIELD OBSERVATIONS, STANBERRY LAKE, FAYETTE COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/4/81	WATER COLOR:	grnsh-brn	grnsh-brn	grnsh-brn	CLOUD COVER:	overcast	clear	WATER LEVEL OF LAKE: below normal 12"
	SEDIMENT:	moderate	moderate	moderate	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: none
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	small	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SW	NW	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	waterfowl	waterfowl	waterfowl				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:	Harry Walton Walt Horsthemke		ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/26/81	WATER COLOR:	grn-brn	grn-brn	grn-brn	CLOUD COVER:	few clouds	overcast	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	mod. rain	RECREATIONAL USAGE: fishing
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	small	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	cool	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	S		LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:	Harry Walton Walt Horsthemke		ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR;				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

The lower limit of the euphotic zone of Stanberry Lake (estimated at twice the Secchi depth) was 1.7 feet at all three sites on May 24. Since Stanberry Lake is so shallow (average depth 5 feet), it may not stratify and the bottom waters may remain oxygenated by mixing due to wind.

SUMMARY AND RECOMMENDATIONS

Summary

Stanberry Lake, a small, shallow, organizationally-owned impoundment in south-central Illinois, was sampled on May 24, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers Walter Horsthemke and Harry Walton recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average transparency of Stanberry Lake was 10 inches, which ranked 80th of the 87 lakes monitored by volunteers in 1981 (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health and was in the range generally associated with substantial use impairment problems in Illinois lakes. Field observations indicated that the transparency was influenced by both sediment and algae.

Stanberry Lake is undergoing the process of eutrophication as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment inputs were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in identified source areas of the watershed, particularly those closest to the lake, may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

Continued monitoring is recommended for Stanberry Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake watershed management strategies.

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GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

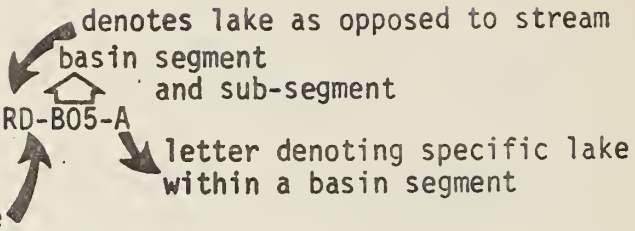
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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1981 VOLUNTEER LAKE

MONITORING PROGRAM REPORT

LAKE SPRINGFIELD / SANGAMON CO.

1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Special volunteer monitoring programs to include additional sites, a greater frequency of sampling, and surface water samples collected by volunteers to be analyzed by Illinois EPA laboratories were developed for certain lakes (e.g., Lake Springfield).

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled, "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Lake Springfield is a 4,024 acre impoundment owned by the City of Springfield, Sangamon County, Illinois. The lake, which was constructed in 1931 by damming Lick and Sugar Creeks, has a maximum depth of 40 feet, an average depth of 13 feet and a storage capacity of 53,478 acre-feet (Table 1).

Lake Springfield serves as a potable water supply for the City. Major recreational uses associated with the lake include fishing, swimming, power boating, waterskiing, sail boating, picnicking and waterfowl observation. Access is generally unlimited. The shoreline is restricted from fishing in residential areas. A lake use fee is charged for boats.

The 165,366 acre watershed drainage area of Lake Springfield is estimated to be 88% row crops. The lake shoreline is primarily residential.

TABLE 1. LAKE ASSESSMENT SUMMARY, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS, (RE-A05-F).

I. GENERAL INFORMATION

River Basin: Sangamon
Segment: A05

Ownership: City of Springfield

Surface Area (Acres): 4024.5*
Watershed Area (Acres): 165,366*
Maximum Depth (Feet): 40.0*
Average Depth (Feet): 13.0*
Storage Capacity (Acre/Feet): 53,478*
Inflowing Stream(s): Lick Creek, Sugar Creek
Outflowing Stream(s): Sugar Creek
Water Retention Time: 0.482 years*
Lake Type: dammed stream
Year Constructed: began 1931, filled 1935

II. USAGE

Public Access: yes
Lake Usage:
- Potable Water Supply: heavy
- Industrial Water Supply: light
- Agricultural Water Supply: light
- Cooling Water: moderate
- Recreation: very heavy
  - Fishing: heavy
  - Swimming: moderate
  - Power Boating: heavy
  - Row Boating or Canoeing: light
  - Sailboating: heavy
  - Camping: light
  - Picnicking: moderate
  - Waterfowl Hunting: none
  - Waterfowl Observation: moderate
  - Other: waterskiing - heavy

Recreational Facilities:
beach, several picnic areas, 1 campground, 2 boat launches, concession

Shoreline Usage (Percent):
- Urban (Including Streets): 5%
- Residential (Including Lawns): 50%
- Golf Courses: 5%
- Pasture or Grassland: 5%
- Woodland: 30%
- Row Crops:
- Wetland: 2.5%
- Other: Parks: 2.5%

Watershed Usage (Percent):
- Urban:
- Residential: 2%
- Golf Courses:
- Pasture or Grassland: 8%
- Woodland: 1%
- Row Crops: 88%
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: fair
Fishing: good
Conditions and Extent:
- Suspended Sediment: large
- Deposition of Sediment: large
- Algal Blooms: slight
- Aquatic Weeds: slight
- Taste and/or Odor: slight
- Water Level Fluctuation: moderate
- Fishkills: moderate
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage: yes
- Septic Tanks: yes
- Pasture or Grassland Runoff: yes
- Cropland Runoff: yes
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses: yes
- Orchards: yes
- Forestry Operations Runoff:
- Mining:
- Waterfowl: yes
- Sediment in Lake: yes
- Other:

V. LAKE MANAGEMENT

Comments: Emergent vegetation (lotus) cut by machine in backwaters each summer.

Information Supplied By Mr. Tim Hillary (1981); *Illinois State Water Survey, Sediment Survey, 1977.

Suspended sediment and deposition of sediment are considered substantial problems for Lake Springfield, while water level fluctuations and fish kills are considered moderate problems. Urban storm drainage, septic tanks, pasture or grassland runoff, cropland runoff, construction site runoff, fertilizer or pesticides from lawns/golf courses, orchards, waterfowl and sediment in the lake are cited as potential pollution sources.

Assessment information for Lake Springfield was provided by Tim Hillary of the Springfield Bass Club and the Illinois State Water Survey (1977). Monitoring was performed by Tim Hillary, Mary Ann Miller, a chemist at City Water, Light and Power, and Shelley Keeling. Secchi readings and field observations were recorded at Sites 1-3 (located in Fig. 1) on 33 dates and at Site 4 on 9 dates in 1981. In addition, surface water samples were collected by Shelley Keeling for analysis of total suspended solids, volatile suspended solids and turbidity on six dates in July, August, and September.

RESULTS AND DISCUSSION

The Secchi monitoring data for Lake Springfield are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations data are summarized in Table 4. Surface water samples were also collected on six dates in July, August, and September and analyzed for turbidity, total suspended solids (TSS), and volatile suspended solids (VSS). Results for turbidity, TSS, and VSS are summarized in Tables 5, 6, and 7, respectively.

Secchi transparency and water quality monitoring results will be presented for the lake as a whole, then spatial (within lake) and seasonal differences in the measured water quality parameters (transparency, turbidity, TSS, and VSS) will be examined. Finally, the relationship of the results to lake uses will be discussed.

General Water Quality of Lake Springfield

The average Secchi disc transparency of Lake Springfield was 21.8 inches, which ranked number 61 when the average transparencies of volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was below the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems for Illinois lakes.

Mean (+ Standard Deviation) surface water turbidity was 16.76 ($\pm$ 29.84) NTU; TSS, 27.44 (+ 32.68) mg/l; and VSS, 11.0 (+ 23.4) mg/l; as compared to an average of 9.4 (+ 10.1) NTU turbidity; 17.3 (+ 13.2) mg/l TSS; and 6.5 ($\pm$ 19.8) mg/l VSS for 65 Illinois lakes sampled in 1980-1981. Thus, the turbidity and suspended matter in Lake Springfield are above average for Illinois lakes.

FIGURE 1

LAKE SPRINGFIELD

SANGAMON COUNTY

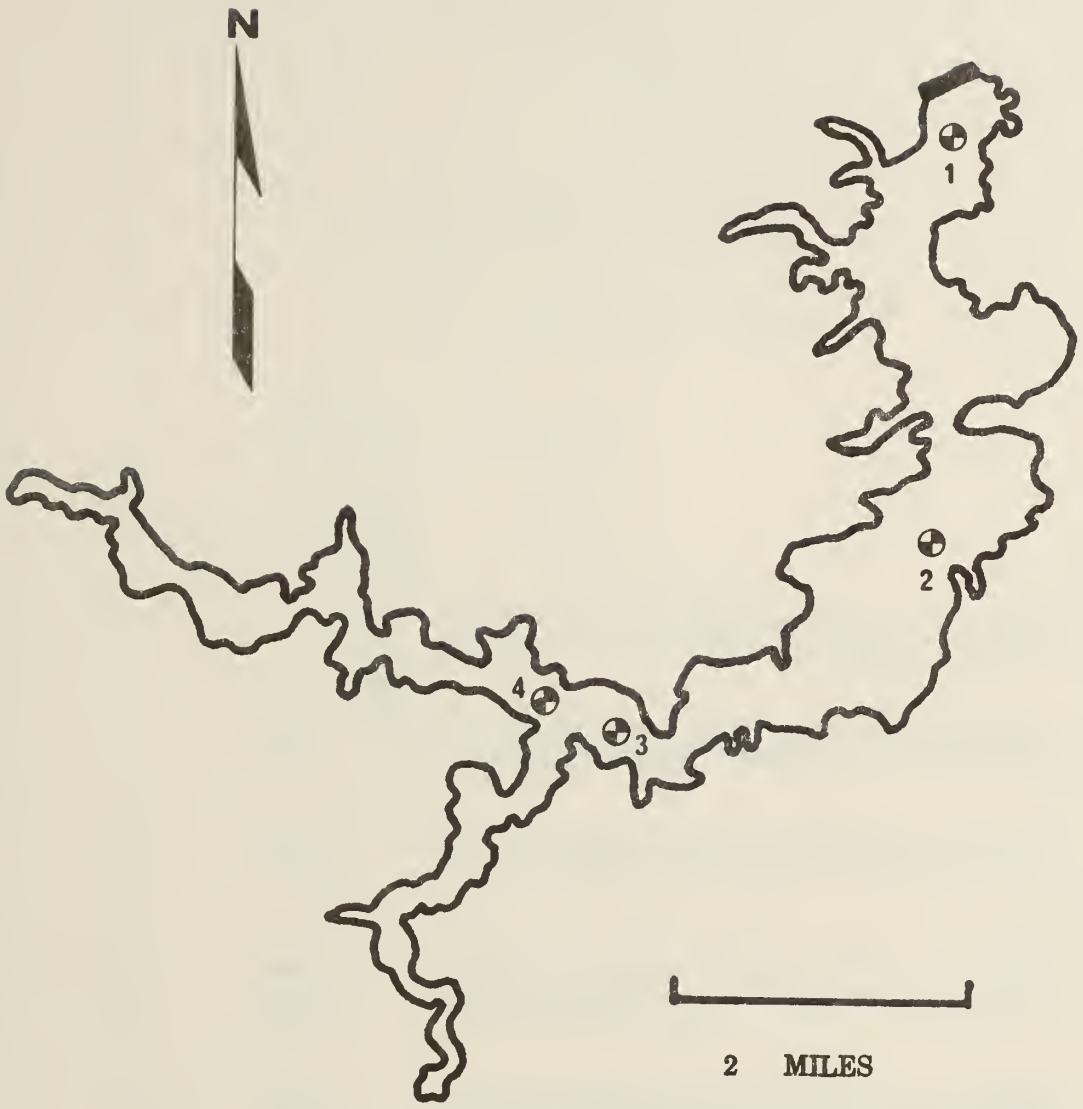


TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) SPRINGFIELD/SANGAMON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	SITE 4	MEAN	STD DEV
05/ 12	24.0	18.0	12.0	-1.0	18.0	6.0
05/ 27	30.0	13.0	12.0	-1.0	18.3	10.1
05/ 30	30.0	24.0	-1.0	18.0	24.0	6.0
06/ 6	36.0	36.0	30.0	-1.0	34.0	3.5
06/ 15	48.0	12.0	6.0	-1.0	22.0	22.7
06/ 23	33.0	14.0	11.0	-1.0	19.3	11.0
06/ 25	24.0	18.0	18.0	12.0	18.0	4.9
07/ 5	36.0	36.0	12.0	12.0	24.0	13.9
07/ 6	24.0	8.0	12.0	-1.0	14.7	8.3
07/ 8	24.0	7.0	2.0	-1.0	11.0	11.5
07/ 11	22.0	6.0	6.0	-1.0	11.3	9.2
07/ 15	30.0	14.0	10.0	-1.0	18.0	10.6
07/ 16	24.0	12.0	10.0	-1.0	15.3	7.6
07/ 20	24.0	12.0	12.0	-1.0	16.0	6.9
07/ 23	22.0	12.0	4.0	-1.0	12.7	9.0
07/ 26	20.0	12.0	8.0	-1.0	16.3	11.2
07/ 27	24.0	12.0	9.0	-1.0	15.0	7.9
07/ 30	18.0	12.0	8.0	8.0	11.5	4.7
07/ 31	24.0	18.0	11.0	-1.0	17.7	6.5
08/ 12	36.0	24.0	14.0	-1.0	24.7	11.0
08/ 13	36.0	30.0	16.0	-1.0	27.3	10.3
08/ 15	42.0	36.0	24.0	18.0	30.0	11.0
08/ 19	24.0	16.0	12.0	-1.0	17.3	6.1
08/ 27	36.0	30.0	20.0	-1.0	28.7	8.1
08/ 29	42.0	42.0	24.0	18.0	31.5	12.4
08/ 30	36.0	24.0	20.0	-1.0	26.7	8.3
09/ 2	30.0	24.0	12.0	-1.0	22.0	9.2
09/ 3	36.0	24.0	16.0	-1.0	25.3	10.1
09/ 12	42.0	42.0	24.0	18.0	31.5	12.4
10/ 8	18.0	24.0	16.0	-1.0	19.3	4.2
10/ 12	36.0	36.0	30.0	30.0	33.0	3.5
10/ 27	30.0	30.0	24.0	24.0	27.0	3.5
10/ 30	30.0	24.0	24.0	-1.0	26.0	3.5

SUMMARY STATISTICS

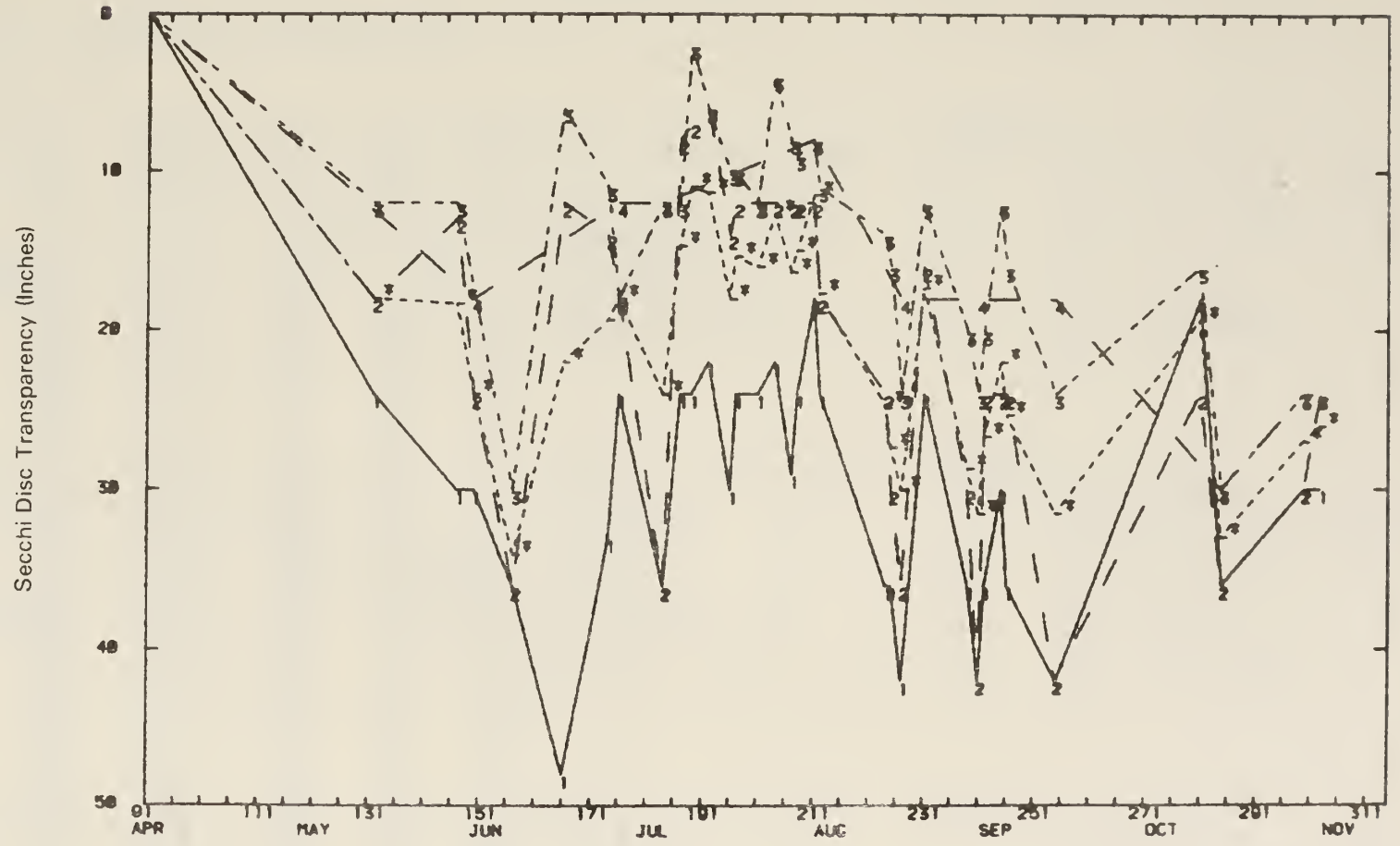
	SITES			LAKE	
MEAN	30.3	21.3	14.7	17.6	21.0
STD DEV	7.5	10.4	7.3	6.6	10.4
MIN	18.0	6.0	2.0	8.0	2.0
MAX	48.0	42.0	30.0	30.0	48.0

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) SPRINGFIELD/SANGAMON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)



KEY

1 Site 1
2 Site 2
3 Site 3
* Mean (Average)

TABLE 3

DEPTH OF SITE (FEET) SPRINGFIELD/SANGAMON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	SITE 4	MEAN	STD DEV
05/ 12	25.5	21.0	10.0	-1.0	18.8	8.0
05/ 27	16.0	19.5	14.0	-1.0	16.5	2.0
05/ 30	23.5	18.0	-1.0	11.0	17.5	6.3
06/ 6	22.0	18.0	10.0	-1.0	16.7	6.1
06/ 15	22.0	16.0	12.5	-1.0	17.5	4.8
06/ 23	27.0	24.5	14.5	-1.0	22.0	6.6
06/ 25	26.0	18.5	10.0	10.0	16.1	7.7
07/ 3	28.0	18.0	12.0	10.0	17.0	8.1
07/ 6	27.0	21.0	27.0	-1.0	25.0	3.5
07/ 8	24.0	18.5	12.0	-1.0	18.2	6.0
07/ 11	24.0	11.0	18.5	-1.0	17.8	6.5
07/ 15	25.5	20.0	12.5	-1.0	19.3	6.5
07/ 16	24.0	18.5	14.0	-1.0	18.8	5.0
07/ 20	25.0	19.0	12.0	-1.0	18.7	6.5
07/ 23	25.0	19.0	13.5	-1.0	18.8	5.9
07/ 26	25.0	17.0	14.0	-1.0	18.7	5.7
07/ 27	26.0	19.5	13.0	-1.0	19.5	6.5
07/ 30	28.0	12.0	11.0	11.0	15.5	8.3
07/ 31	25.0	19.5	12.0	-1.0	18.8	6.5
08/ 12	26.0	18.0	12.0	-1.0	18.7	7.0
08/ 13	25.0	16.5	11.5	-1.0	17.7	6.8
08/ 15	28.0	14.0	11.0	10.0	15.8	8.3
08/ 19	26.0	18.0	12.0	-1.0	18.7	7.0
08/ 27	24.5	20.0	12.0	-1.0	18.8	6.3
09/ 29	28.0	18.0	11.0	10.0	16.8	8.3
09/ 30	25.0	26.0	12.0	-1.0	21.0	7.0
09/ 2	26.5	18.5	14.0	-1.0	19.7	6.3
09/ 3	26.0	18.5	14.0	-1.0	19.5	6.1
09/ 12	26.0	18.0	12.0	11.0	16.8	6.0
10/ 8	23.0	19.0	9.5	-1.0	17.2	6.0
10/ 12	28.0	18.0	12.0	10.0	17.0	8.1
10/ 27	28.0	16.0	12.0	10.0	16.5	8.1
10/ 30	21.0	18.0	12.0	-1.0	17.0	4.6

	SITES			LAKE	***SUMMARY STATISTICS***
MEAN	25.1	18.4	12.0	10.3	18.1
STD DEV	2.5	2.0	3.1	0.5	6.0
MIN	16.0	11.0	9.5	10.0	9.5
MAX	28.0	26.0	27.0	11.0	28.0

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/12/81	WATER COLOR:	mod. brown	mod. brown	mod. brown
	SEDIMENT:	moderate	moderate	moderate
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	many clouds
PRECIPITATION:	no rain	v. lt. rain
WAVES:	calm	moderate
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	E	NE
OBSERVATIONS MADE BY:	M.A. Miller	

OTHER COMMENTS

WATER LEVEL OF LAKE: 560' normal
RECREATIONAL USAGE: fishing, sailing,

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/27/81	WATER COLOR:	lt. brown	lt. brown	lt. brown
	SEDIMENT:	slight	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	hazy	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	calm
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	S	
OBSERVATIONS MADE BY:	M.A. Miller	

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/15/81	WATER COLOR:	mod. brown	mod. brown	mod. brown
	SEDIMENT:	moderate	moderate	moderate
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	few clouds
PRECIPITATION:	no rain	no rain
WAVES:	white caps	ripple
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	SE	
OBSERVATIONS MADE BY:	M.A. Miller	

OTHER COMMENTS

WATER LEVEL OF LAKE: (560.42) above normal
RECREATIONAL USAGE: sailing, fishing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/23/81	WATER COLOR;	lt. brown	lt. brown	lt. brown
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	few clouds
PRECIPITATION:	no rain	v. lt. rain
WAVES:	calm	small
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:		
OBSERVATIONS MADE BY:	M.A. Miller	

OTHER COMMENTS

WATER LEVEL OF LAKE: (560.60) above normal
RECREATIONAL USAGE: fishing, power boating, waterskiing, sailing, row boating/canoeing, swimming

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/6/81	WATER COLOR:	very brown	very brown	very brown	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE: above normal 9"
	SEDIMENT:	moderate	large	large	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming,
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	power boating, sailing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	NE		LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	none	none	none	OBSERVATIONS MADE BY:	M.A. Miller		ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/8/81	WATER COLOR:	mod. green	mod. brown	very brown	CLOUD COVER:	few clouds	hazy	WATER LEVEL OF LAKE: #1 5" above normal (560.5)
	SEDIMENT:	slight	slight	large	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, power
	ALGAE:	minimal	minimal	minimal	WAVES:	small	ripple	boating, waterskiing, sailing, camping,
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	very hot	picnicking
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SW	SW	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/11/81	WATER COLOR:	mod. green	mod. brown	pea soup	CLOUD COVER:	clear	few clouds	WATER LEVEL OF LAKE: 560.09 normal
	SEDIMENT:	minimal	slight	slight	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming,
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	small	power boating, waterskiing, camping,
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	very hot	picnicking
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	E		LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/15/81	WATER COLOR:	clear	mod. brown	mod. brown	CLOUD COVER:	many clouds	hazy	WATER LEVEL OF LAKE: 560.20 (.20 over)
	SEDIMENT:	minimal	slight	slight	PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE: fishing, swimming,
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	small	power boating, camping, waterskiing,
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	very hot	row boating/canoeing
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SW	SE	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/16/81	WATER COLOR:	mod. green	mod. brown	mod. brown	CLOUD COVER:	many clouds	overcast	WATER LEVEL OF LAKE:
	SEDIMENT:	minimal	slight	slight	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE: fishing, camping
	ALGAE:	minimal	minimal	minimal	WAVES:	moderate	moderate	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	NW	SW	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/20/81	WATER COLOR:	mod. green	mod. brown	mod. brown	CLOUD COVER:	many clouds	many clouds	(560.42)
	SEDIMENT:	minimal	slight	slight	PRECIPITATION:	no rain	lt. rain	WATER LEVEL OF LAKE: above normal
	ALGAE:	minimal	minimal	minimal	WAVES:	small	small	RECREATIONAL USAGE: fishing, swimming
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	power boating/ sailing
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	W		
	OTHER SUBSTANCES:	none	none	none				LAKE MANAGEMENT:
					OBSERVATIONS MADE BY:	Mary Ann Langley		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/23/81	WATER COLOR:	mod. brown	very brown	very brown	CLOUD COVER:	overcast	many clouds	WATER LEVEL OF LAKE: normal 560.
	SEDIMENT:	slight	slight	moderate	PRECIPITATION:	mod. rain	no rain	RECREATIONAL USAGE: fishing, power
	ALGAE:	minimal	minimal	minimal	WAVES:	moderate	small	boating
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	ENE		LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/26/81	WATER COLOR:	mod. brown	mod. brown	mod. brown	CLOUD COVER:	overcast	many clouds	WATER LEVEL OF LAKE:
	SEDIMENT:	minimal	slight	slight	PRECIPITATION:	v. lt. rain	lt. rain	RECREATIONAL USAGE: fishing, power
	ALGAE:	minimal	minimal	minimal	WAVES:	small	small	boating, waterskiing, camping
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	W		LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/27/81	WATER COLOR:	brnsh-grn	mod. brown	very brown	CLOUD COVER:	overcast	overcast	(560.43)
	SEDIMENT:	minimal	slight	moderate	PRECIPITATION:	lt. rain	lt. rain	WATER LEVEL OF LAKE: above normal
	ALGAE:	minimal	minimal	minimal	WAVES:	white caps	small	RECREATIONAL USAGE: fishing, camping sailing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	E	W	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/31/81	WATER COLOR:	very green	very green	mod. green	CLOUD COVER:	clear	clear	(.03 over)
	SEDIMENT:	minimal	minimal	slight	PRECIPITATION:	no rain	no rain	WATER LEVEL OF LAKE: 560.03
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	RECREATIONAL USAGE: fishing, power boating, waterskiing, sailing, camping
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	E		LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/12/81	WATER COLOR:	mod. grn.	gr.-brn.	brnsh-gr.	CLOUD COVER:	hazy	clear	
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	WATER LEVEL OF LAKE: 560.06
	ALGAE:	minimal	minimal	minimal	WAVES:	sm. waves	sm. waves	RECREATIONAL USAGE: fishing, power boating, waterskiing, sailing, camping
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	west	northwest	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/13/81	WATER COLOR:	grnsh-brn.	mod. brn.	mod. brn.	CLOUD COVER:	clear	hazy	
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	WATER LEVEL OF LAKE: 560.06
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	small waves	RECREATIONAL USAGE: fishing, power boating, waterskiing, sailing, camping
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	southwest	west	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:	Shelly Keeling		ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
8/19/81	WATER COLOR:	grnsh-brn	mod. brown	yellowish
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	clear
PRECIPITATION:	no rain	no rain
WAVES:	ripple	small
AIR TEMPERATURE:	hot	warm
WIND DIRECTION:	NE	NE
OBSERVATIONS MADE BY:	Shelly Keeling	

OTHER COMMENTS

WATER LEVEL OF LAKE: above normal 1"
RECREATIONAL USAGE: fishing, power boating, waterskiing, sailing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
8/27/81	WATER COLOR;	brnsh-grn	very brown	brnsh-grn
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	overcast
PRECIPITATION:	v. lt. rain	mod. rain
WAVES:	ripple	small
AIR TEMPERATURE:	warm	hot
WIND DIRECTION:	S	S
OBSERVATIONS MADE BY:	Shelly Keeling	

OTHER COMMENTS

WATER LEVEL OF LAKE: (560.08) above normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
8/30/81	WATER COLOR:	grnsh. br.	mod. brwn.	mod. brwn.
	SEDIMENT:	minimal	minimal	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	hazy	clear
PRECIPITATION:	no rain	mod. rain
WAVES:	mod. waves	mod. waves
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	south	southwest
OBSERVATIONS MADE BY:	Shelly Keeling	

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE: fishing, sailing, camping, waterskiing, power boating

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
9/2/81	WATER COLOR;	very brn.	grnsh. brn.	mod. brown
	SEDIMENT:	minimal	slight	slight
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	minimal	minimal	minimal
	OTHER SUBSTANCES:	none	none	none
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	many clouds	many clouds
PRECIPITATION:	no rain	very lt. rain
WAVES:	ripple waves	sm. waves
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	northwest	
OBSERVATIONS MADE BY:	Shelly Keeling	

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE: fishing, power boat camping.

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/3/81	WATER COLOR:	very brwn.	brnsh - gr.	very brwn.	CLOUD COVER:	overcast	many clouds	WATER LEVEL OF LAKE:
	SEDIMENT:	minimal	minimal	moderate	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	northwest	north	LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: Shelly Keeling			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
10/8/81	WATER COLOR:	lt. brown	lt. brown	brnsh-grn	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE: below normal 6"
	SEDIMENT:	minimal	minimal	slight	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, power
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	ripple	boating
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	cool	cool	
	WEEDS NEAR SHORE:	minimal	minimal	slight	WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: M.A. Miller			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	fishy				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
10/30/81	WATER COLOR:	lt. brown	lt. brown	lt. brown	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE: (559.25) below normal
	SEDIMENT:	slight	slight	slight	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, power
	ALGAE:	minimal	minimal	minimal	WAVES:	small	calm	boating, sailing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	cool	warm	
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
					OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:
	ODOR:							

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
5/30/81	WATER COLOR:	brnsh-grn	mod. brown	very brown						
	SEDIMENT:	moderate	large	large						
	ALGAE:	minimal	minimal	minimal						
	WEEDS AT SITE:	minimal	minimal	minimal						
	WEEDS NEAR SHORE:	minimal	minimal	slight						
	OTHER SUBSTANCES:	waterfowl detritus	clippings	refuse clippings						
	ODOR:	none	none	fishy						

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
	1, 2, 3	CLOUD COVER:	hazy	overcast	WATER LEVEL OF LAKE:	normal
		PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE:	fishing, power boating, waterskiing, row boating/canoeing, sailing, camping, picnicking
		WAVES:	ripple	small		
		AIR TEMPERATURE:	warm	warm	LAKE MANAGEMENT:	none known
		WIND DIRECTION:	NNW	NW		
		OBSERVATIONS MADE BY:	Tim Hillary		ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
6/6/81	WATER COLOR:	brnsh-grn	lt. brown	lt. brown	mod. brown					
	SEDIMENT:	slight	slight	slight	slight					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	slight	slight					
	OTHER SUBSTANCES:	none	none	refuse	detritus					
	ODOR:	none	none	none	none					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
	1, 2, 3, 4	CLOUD COVER:	overcast	overcast	WATER LEVEL OF LAKE:	normal
		PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE:	fishing, swimming, power boating, waterskiing, row boating/canoeing, sailing, camping, picnicking
		WAVES:	small	moderate		
		AIR TEMPERATURE:	warm	warm	LAKE MANAGEMENT:	none known
		WIND DIRECTION:	ENE	NE		
		OBSERVATIONS MADE BY:	Tim Hillary		ADDITIONAL COMMENTS:	

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
6/25/81	WATER COLOR:	brnsh-grn	lt. brown	mod. brown	mod. brown					
	SEDIMENT:	moderate	moderate	large	large					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	minimal	slight					
	OTHER SUBSTANCES:	none	none	none	none					
	ODOR:	no odor	no odor	no odor	no odor					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
	1, 2, 3, 4	CLOUD COVER:	clear	overcast	WATER LEVEL OF LAKE:	above normal 4"
		PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE:	fishing, swimming, power boating, waterskiing, row boating/canoeing, sailing, camping, picnicking
		WAVES:	ripple	moderate		
		AIR TEMPERATURE:	hot	hot	LAKE MANAGEMENT:	none known
		WIND DIRECTION:	NW	NW		
		OBSERVATIONS MADE BY:	Tim Hillary		ADDITIONAL COMMENTS:	

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
7/3/81	WATER COLOR:	lt. brown	mod. brown	mod. brown	very brown					
	SEDIMENT:	slight	slight	moderate	large					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	minimal	slight					
	OTHER SUBSTANCES:	none	none	none	none					
	ODOR:	no odor	no odor	no odor	fishy					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
	1, 2, 3, 4	CLOUD COVER:	hazy	overcast	WATER LEVEL OF LAKE:	above normal approx. 9"
		PRECIPITATION:	no rain	lt. rain	RECREATIONAL USAGE:	fishing, power boating, waterskiing, sailing
		WAVES:	ripple	small		
		AIR TEMPERATURE:	hot	warm	LAKE MANAGEMENT:	none known
		WIND DIRECTION:	WNW	NW		
		OBSERVATIONS MADE BY:	Tim Hillary		ADDITIONAL COMMENTS:	

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
7/30/81	WATER COLOR:	mod. brown	very brown	very brown	very brown					
	SEDIMENT:	moderate	large	large	large					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	minimal	slight					
	OTHER SUBSTANCES:	none	none	none	none					
	ODOR:	fishy	soil	soil	soil					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	1, 2, 3, 4	CLOUD COVER:	clear	overcast	WATER LEVEL OF LAKE: above normal approx. 6"
		PRECIPITATION:	no rain	mod. rain	RECREATIONAL USAGE: fishing, swimming, power boating, waterskiing, sailing
		WAVES:	ripple	small	
		AIR TEMPERATURE:	warm	hot	LAKE MANAGEMENT: mechanical cutting of water lilies and lotus pads mid-July
		WIND DIRECTION:	NW	SW	
		OBSERVATIONS MADE BY: Tim Hillary			ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
8/29/81	WATER COLOR:	lt. brown	lt. brown	mod. brown	mod. brown					
	SEDIMENT:	minimal	minimal	slight	slight					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	minimal	slight					
	OTHER SUBSTANCES:	none	none	waterfowl	none					
	ODOR:	no odor	fishy	no odor	no odor					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	1, 2, 3, 4,	CLOUD COVER:	clear	hazy	WATER LEVEL OF LAKE: approx. 3"
		PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, swimming, power boating, waterskiing, sailing
		WAVES:	calm	ripple waves	
		AIR TEMPERATURE:	warm	warm	LAKE MANAGEMENT: none known.
		WIND DIRECTION:	northwest	west	
		OBSERVATIONS MADE BY: Tim Hillary			ADDITIONAL COMMENTS:

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
9/12/81	WATER COLOR:	lt. green	brnsh-grn	lt. brown	lt. brown					
	SEDIMENT:	minimal	slight	slight	moderate					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	slight	slight					
	OTHER SUBSTANCES:	none	none	oil films	dead fish					
	ODOR:	no odor	fishy	no odor	no odor					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
	1, 2, 3, 4	CLOUD COVER:	clear	clear	WATER LEVEL OF LAKE:	above normal 4"
		PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:	fishing, swimming, power boating, waterskiing, sailing, picnicking
		WAVES:	calm	cal m		
		AIR TEMPERATURE:	hot	hot		
		WIND DIRECTION:	W	W	LAKE MANAGEMENT:	none known
		OBSERVATIONS MADE BY:	Tim Hillary		ADDITIONAL COMMENTS:	many dead fish floating in Lick Creek tributary west of Highway 4.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
10/12/81	WATER COLOR:	lt. brown	lt. brown	lt. brown	lt. brown					
	SEDIMENT:	minimal	minimal	minimal	minimal					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	minimal	slight					
	OTHER SUBSTANCES:	none	none	none	waterfowl					
	ODOR:	no odor	no odor	fishy	no odor					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS	
	1, 2, 3, 4	CLOUD COVER:	few clouds	hazy	WATER LEVEL OF LAKE:	below normal 3"
		PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE:	fishing, power boating, sailing
		WAVES:	calm	cal m		
		AIR TEMPERATURE:	cool	warm		
		WIND DIRECTION:	SE	SE	LAKE MANAGEMENT:	none known
		OBSERVATIONS MADE BY:	Tim Hillary		ADDITIONAL COMMENTS:	

TABLE 4. FIELD OBSERVATIONS, LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	SITE 4	SITE 5	SITE 6	SITE 7	SITE 8	SITE 9
10/27/81	WATER COLOR:	clear	clear	lt. brown	lt. brown					
	SEDIMENT:	minimal	minimal	minimal	minimal					
	ALGAE:	minimal	minimal	minimal	minimal					
	WEEDS AT SITE:	minimal	minimal	minimal	minimal					
	WEEDS NEAR SHORE:	minimal	minimal	minimal	minimal					
	OTHER SUBSTANCES:	none	none	leaves	leaves					
	ODOR:	no odor	no odor	no odor	no odor					

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	1, 2, 3, 4	CLOUD COVER:	clear	hazy	WATER LEVEL OF LAKE: normal
		PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, power boating
		WAVES:	calm	calm	
		AIR TEMPERATURE:	warm	cool	LAKE MANAGEMENT: none
		WIND DIRECTION:	SW	NW	
		OBSERVATIONS MADE BY: Tim Hillary			ADDITIONAL COMMENTS:

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
		CLOUD COVER:			WATER LEVEL OF LAKE:
		PRECIPITATION:			RECREATIONAL USAGE:
		WAVES:			
		AIR TEMPERATURE:			LAKE MANAGEMENT:
		WIND DIRECTION:			
		OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

DATE	SITE(S)	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
		CLOUD COVER:			WATER LEVEL OF LAKE:
		PRECIPITATION:			RECREATIONAL USAGE:
		WAVES:			
		AIR TEMPERATURE:			LAKE MANAGEMENT:
		WIND DIRECTION:			
		OBSERVATION MADE BY:			ADDITIONAL COMMENTS:

TABLE 5

TURBIDITY (NTU) IN SURFACE WATER SAMPLES FROM
LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS, 1981

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD. DEV.
810708	6.1	55.0	116.0	59.0	55.06
810716	3.6	4.7	5.1	4.47	0.78
810723	6.0	18.0	56.0	23.3	28.31
810813	6.0	4.0	3.0	4.33	1.53
810827	2.2	2.8	3.5	2.83	0.65
810903	2.5	2.5	4.8	3.27	1.33

STATISTICS				OVERALL LAKE STATISTICS
MEAN	4.4	14.5	31.4	16.76
STD. DEV.	1.85	20.69	46.36	29.84
MIN.	2.2	2.5	3.0	2.2
MAX.	6.1	55.0	116.0	116.0

TABLE 6

TOTAL SUSPENDED SOLIDS (MG/L) IN SURFACE WATER SAMPLES
FROM LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS, 1981

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD. DEV.
810718	8	120	91	73.0	58.13
810716	10	19	11	6.7	4.93
810723	12	16	58	28.7	25.48
810813	39	7	50	32.0	22.34
810827	5	7	13	8.33	4.16
810903	6	7	15	9.33	4.93

STATISTICS				OVERALL LAKE STATISTICS
MEAN	13.2	29.30	39.7	27.44
STD. DEV.	12.95	44.72	32.31	32.68
MIN.	5	7	11	5
MAX.	39	120	91	120

TABLE 7

VOLATILE SUSPENDED SOLIDS (MG/L) IN SURFACE WATER SAMPLES
FROM LAKE SPRINGFIELD, SANGAMON COUNTY, ILLINOIS, 1981

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD. DEV.
810708	4	102	13	39.7	54.2
810916	2	2	0	1.3	1.15
810723	2	2	10	3.0	4.62
810813	14	2	22	12.7	10.07
810827	3	4	5	4	1.00
810903	2	3	6	3.7	2.08

STATISTICS				OVERALL LAKE STATISTICS
MEAN	5.0	19.5	9.2	11.0
STD. DEV.	4.56	40.44	7.73	23.40
MIN.	2	2	0	2
MAX.	14	102	22	102

The water level was above normal much of the time during the 1981 sampling period except during the month of October when the lake was as much as 4 inches below normal. Due to the above average rainfall during 1981, transparency may have been lower and suspended solids and turbidity higher than usual.

Spatial and Seasonal Differences in Water Quality

The Secchi disc transparency of Lake Springfield ranged from a minimum of 2 inches at Site 3 on July 8 to a maximum of 48 inches at Site 1 on June 15. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates except June 15.

As is typical of Illinois reservoirs, a pattern of increasing transparency and decreasing suspended solids and turbidity from the headwaters to the dam was apparent in Lake Springfield. Secchi transparency averaged 30.3 inches at Site 1, 21.3 inches at Site 2, 14.7 inches at Site 3, and 17.6 inches at Site 4. The higher average transparency at Site 4 was probably related to the fact that only nine samples were collected at Site 4, while 33 were collected at Site 3.

Turbidity (NTU) values were greatest at Site 3 on July 8, which corresponds with the minimum Secchi transparency readings at Site 3 of 2 inches on July 8.

Total suspended solids and volatile suspended solids (Tables 6 and 7) were highest on July 8 as well, with average values of 73.0 mg/l and 39.7 mg/l, respectively.

The Springfield area received a 3 inch rainfall on July 4. It is very possible that the runoff from the rainstorm had a direct influence on the Secchi disc readings and turbidity and suspended solids values on July 8.

Field observations (Table 4) confirm the readings on July 8 when the water color was noted as "very brown" at Site 3.

The water color at Site 3 became "pea soup" seven days following the heavy rain on July 11 (Table 4). It is possible that a large influx of nutrients with the stormwater runoff produced an algal bloom in the vicinity of Site 3.

Relationship to Lake Uses

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish

activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Lake Sprinfield (estimated at twice the Secchi depth) ranged from 3-8 feet at Site 1, from 1-7 feet at Site 2, and from 0.3-5 feet at Site 3. Since Lake Springfield is deep enough to thermally stratify and had an euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters. However, circulation patterns within the lake brought about by the intake and discharge of cooling water may keep it mixed and aerated.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. These substances can contribute to serious taste and odor problems in drinking water if water supply is taken from near the lake bottom during summer stratification. When the substances which have accumulated in the bottom waters during stratification periods are distributed throughout the lake during mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Lake Springfield, a large multipurpose impoundment in central Illinois, was sampled on 33 dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteers recorded Secchi disc transparency, total depth, and field observations at three or four sites and reported results to the Illinois EPA. Surface water samples were also collected on six dates for analysis of suspended solids and turbidity.

The average Secchi disc transparency of Lake Springfield (21.8 inches), which ranked 61st of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health, and was in the range generally associated with use impairment problems for Illinois lakes. Turbidity and suspended solids were also above average for Illinois lakes.

A spatial trend of increasing transparency and decreasing suspended solids and turbidity from the headwaters to the dam was apparent in Lake Springfield. Lowest transparencies and highest turbidity and suspended solids values were recorded after rainfall events. Field observations of brown water color evidenced the effect of sediment on transparency.

Lake Springfield is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Lake Springfield is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of sediment and algae problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Pollution contributions from septic tanks, urban storm drainage, fertilization of lawns, and waterfowl should also be investigated and minimized. In-lake management may also warrant consideration. Drawing oxygenated water from the upper strata for water supply use may help alleviate taste and odor problems.

Continued monitoring is recommended for Lake Springfield. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

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DS:jab/sp3903C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

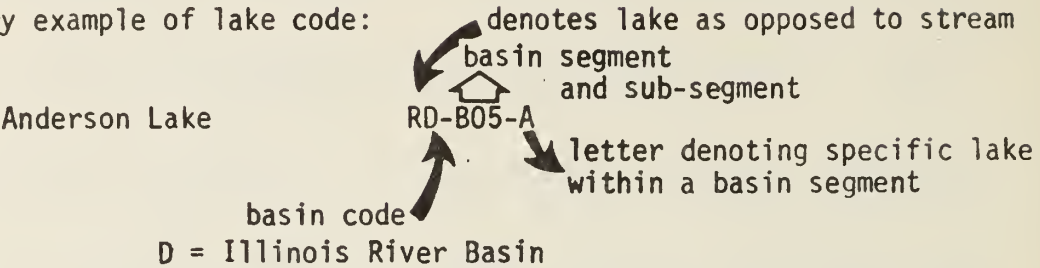
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

SPRING ARBOR LAKE, JACKSON COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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ACKNOWLEDGEMENTS

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Assessment and monitoring information was provided by approximately 140 volunteers throughout the state.

Data handling was performed by John Little, Jill Hardin, Marilyn Budd, Lori Whalen, Cora Stockton, and Karen Janssen. Data analyses were performed and tabular and graphical outputs obtained by John Little using programs developed for the Tektronix desk top computer terminal by Dr. David J. Schaeffer and Vladimir Chernomordikov.

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Spring Arbor Lake is a 100 acre organizationally-owned impoundment located in Jackson County, Illinois. The lake, which was constructed by damming Indian Creek in 1965, has a maximum depth of 50 feet, an average depth of 12 feet and a storage capacity of 1,200 acre-feet (Table 1).

Spring Arbor Lake serves as a recreational lake used for fishing, swimming, power boating, rowboating, canoeing, picnicking and waterfowl hunting. Access is available to organizational members only.

Aquatic weeds are considered a moderate problem for Spring Arbor Lake. Septic tanks and pasture, grassland, and cropland runoff are cited as potential pollution sources.

Assessment information for Spring Arbor Lake was provided by the Illinois Department of Conservation (1977). Monitoring was performed by David R. Derge. Secchi disc depth, total depth and field observations were recorded at three sites (located in Figure 1) on seven dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, SPRING ARBOR LAKE, JACKSON COUNTY, ILLINOIS (RN-A07ZG).

I. GENERAL INFORMATION

River Basin: Big Muddy
Segment: A07

Ownership: Organizational

Surface Area (Acres): 100
Watershed Area (Acres): 500
Maximum Depth (Feet): 50.0
Average Depth (Feet): 12.0
Storage Capacity (Acre/Feet): 1,200
Inflowing Stream(s): Indian Creek
Outflowing Stream(s): Indian Creek
Water Retention Time: 2.058 year
Lake Type: Dammed stream
Year Constructed: 1965

II. USAGE

Public Access: no
Lake Usage:
- Potable Water Supply:
- Industrial Water Supply:
- Agricultural Water Supply:
- Cooling Water:
- Recreation:
  - Fishing: X
  - Swimming: X
  - Power Boating: X
  - Row Boating or Canoeing: X
  - Sailboating:
  - Camping:
  - Picnicking: X
  - Waterfowl Hunting: X
  - Waterfowl Observation:
  - Other:

Recreational Facilities:

_____
_____
_____

Shoreline Usage (Percent):
- Urban (Including Streets):
- Residential (Including Lawns):
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

Watershed Usage (Percent):
- Urban:
- Residential:
- Golf Courses:
- Pasture or Grassland:
- Woodland:
- Row Crops:
- Wetland:
- Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing:
Conditions and Extent:
- Suspended Sediment: slight
- Deposition of Sediment: slight
- Algal Blooms: slight
- Aquatic Weeds:moderate
- Taste and/or Odor:
- Water Level Fluctuation: minimal
- Fishkills: minimal
- Other:

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
- Sewage Treatment Plant Effluent:
- Industrial Discharge:
- Urban Storm Drainage:
- Septic Tanks: possible
- Pasture or Grassland Runoff: X
- Cropland Runoff: X
- Feedlot Runoff:
- Construction Site Runoff:
- Fertilizer or Pesticides from Lawns/Golf Courses:
- Orchards:
- Forestry Operations Runoff:
- Mining:
- Waterfowl:
- Sediment in Lake:
- Other:

V. LAKE MANAGEMENT

Comments: _____

_____

_____

_____

_____

Information Supplied By Illinois Department of Conservation (1977)

FIGURE 1

SPRING ARBOR LAKE

JACKSON COUNTY

RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Spring Arbor Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Spring Arbor Lake

The average Secchi disc transparency of Spring Arbor Lake was 105.6 inches, which ranked number 2 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was greater than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was above average for Illinois lakes.

Spatial and Seasonal Differences in Transparency

The transparency of Spring Arbor Lake ranged from a minimum of 81 inches at Sites 1 on July 2 to a maximum of 120 inches at Site 3 on July 14. Secchi readings were above the four feet minimum recommended for swimming on all sampling dates.

The average transparencies of Sites 3, 2, and 1 were 107.1 inches, 105.4 inches and 104.1 inches, respectively. The relatively high and uniform Secchi readings were probably related, in part, to the lack of shallow depths at any of the sites; it may also indicate that the input of nutrients and sediment is fairly low. The long water retention time of 2.058 years may also be a factor; it would allow the suspended sediment load, entering from the tributaries, to settle out in the upper most areas of the lake, leaving the majority of the lake with a relatively uniform transparency.

Significant seasonal differences were not apparent in the transparency of Spring Arbor Lake. The water was very clear throughout the May - October sampling. Field observations of light green to greenish-brown water color during the sampling period indicated that water transparency was influenced primarily by the presence of algae. Slight to large amounts of aquatic weeds were observed near shore.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) SPRING ARBOR/JACKSON COUNTY, ILLINOIS (VOLUNTEER DATA 198[illegible])

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 10	96.0	108.0	108.0	104.0	6.9
06/ 11	114.0	108.0	114.0	112.0	3.5
07/ 2	81.0	108.0	102.0	97.0	14.2
07/ 14	114.0	108.0	120.0	114.0	6.0
07/ 26	108.0	108.0	108.0	108.0	0.0
09/ 12	108.0	102.0	96.0	102.0	6.0
10/ 10	108.0	96.0	102.0	102.0	6.0

SUMMARY STATISTICS

	SITES			LAKE
MEAN	104.1	105.4	107.1	105.6
STD DEV	11.8	4.7	8.1	8.4
MIN	81.0	96.0	96.0	81.0
MAX	114.0	108.0	120.0	120.0
AV DEPTH	36.6	35.6	33.2	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) SPRING ARBOR/JACKSON COUNTY, ILLINOIS (VOLUNTEER DATA 198[illegible])

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 10	41.0	32.0	30.0	34.3	5.9
06/ 11	39.0	40.0	38.5	39.2	0.8
07/ 2	40.0	33.0	32.0	35.0	4.4
07/ 14	28.0	34.5	30.0	30.8	3.3
07/ 26	30.0	33.0	26.0	29.7	3.5
09/ 12	39.0	38.0	38.0	38.3	0.6
10/ 10	39.5	39.0	38.0	38.8	0.8

SUMMARY STATISTICS

	SITES			LAKE
MEAN	36.6	35.6	33.2	35.2
STD DEV	5.3	3.3	5.0	4.6
MIN	28.0	32.0	26.0	26.0
MAX	41.0	40.0	38.5	41.0
AV DEPTH	36.6	35.6	33.2	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) SPRING ARBOR/JACKSON COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

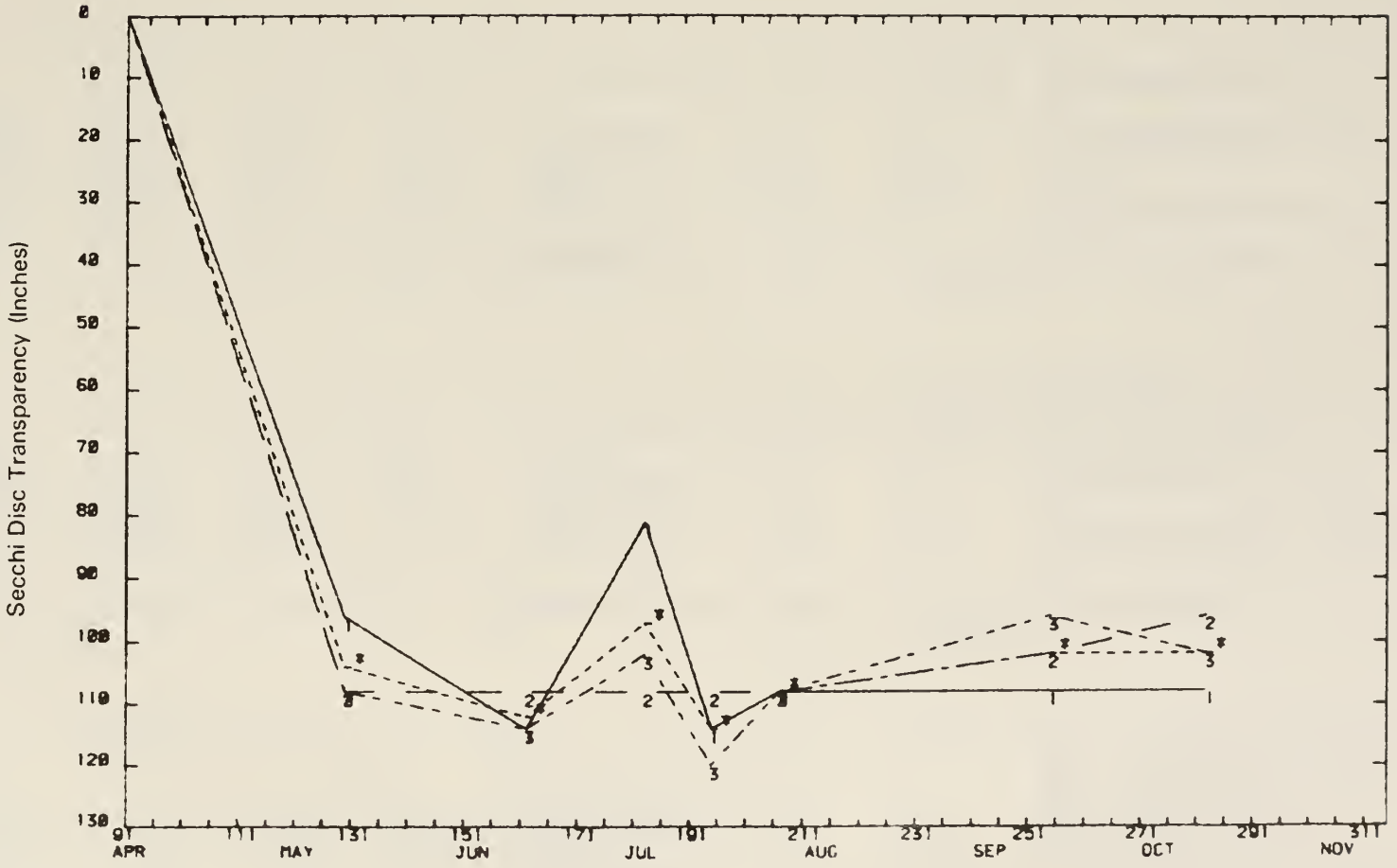

TABLE 4. FIELD OBSERVATIONS, SPRING ARBOR LAKE, JACKSON COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
5/10/8	WATER COLOR:	grnsh.brn	grnsh.brn	grnsh. brn	CLOUD COVER:	many clouds	overcast	WATER LEVEL OF LAKE: 12" below normal
	SEDIMENT:	slight	slight	slight	PRECIPITATION:	no rain	light rain	RECREATIONAL USAGE: fishing, swimming,
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	small	power boating, row boating, & canoeing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	slight	slight	moderate	WIND DIRECTION:	S.E.	S.E.	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:							
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: D.R. Derge			ADDITIONAL COMMENTS: Readings taken during cloud breaks in bright sunlight.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
6/11/81	WATER COLOR:	mod. green	mod. green	mod. green	CLOUD COVER:	many clouds	many clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	lt. rain	lt. rain	RECREATIONAL USAGE: fishing,swimming
	ALGAE:	minimal	minimal	minimal	WAVES:	small	small	power & row boating, canoeing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	
	WEEDS NEAR SHORE:	large	large	large	WIND DIRECTION:	S.	S.	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: David R. Derge			ADDITIONAL COMMENTS: Near shore weeds decrease in shallow areas as depth increases.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/2/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	few clouds	many clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: swimming, power
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	boating
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	very hot	
	WEEDS NEAR SHORE:	minimal	slight	large	WIND DIRECTION:	S.	S.	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: David R. Derge			ADDITIONAL COMMENTS: none

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 21 HOURS	OTHER COMMENTS
7/14/8	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	many clouds	clear	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing & power
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	v. hot	boating
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	v. hot	variable	
	WEEDS NEAR SHORE:	slight	moderate	large	WIND DIRECTION:	light		LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE .. David R. Derge			ADDITIONAL COMMENTS: none

TABLE 4. FIELD OBSERVATIONS, LAKE SPRING ARBOR, JACKSON COUNTY, ILLINOIS, 1981

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/26/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	many clouds	overcast	WATER LEVEL OF LAKE: 6" above normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	mod. rain	RECREATIONAL USAGE: fishing, swimming,
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	ripple	power & row boating or canoeing
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	v. hot	v. hot	
	WEEDS NEAR SHORE:	slight	moderate	large	WIND DIRECTION:	S. - 5	S.E. - 5	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: David R. Derge			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
9/12/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	hazy	few clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing & swimming
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hto	hot	
	WEEDS NEAR SHORE:	moderate	moderate	moderate	WIND DIRECTION:	light	variable	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:	none	none	none				
					OBSERVATIONS MADE BY: David R. Derge			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor				

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
10/10/81	WATER COLOR:	grnsh. brn.	grnsh. brn.	grnsh. brn.	CLOUD COVER:	overcast	few clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	minimal	minimal	PRECIPITATION:	no rain	v. lt. rain	RECREATIONAL USAGE: fishing & power
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	boating
	WEEDS AT SAMPLE SITE:	slight	slight		AIR TEMPERATURE:	warm	warm	
	WEEDS NEAR SHORE:	none	none		WIND DIRECTION:	light	variable	LAKE MANAGEMENT: none
	OTHER SUBSTANCES:							
					OBSERVATIONS MADE BY: D. R. Derge			ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor					

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPEPATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
					OBSERVATIONS MADE :			ADDITIONAL COMMENTS:
	ODOR:							

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Spring Arbor Lake (estimated at twice the Secchi depth) ranged from 13.5-19.0 feet at Site 1, from 16.0-18.0 feet at Site 2, from 16.0-20.0 feet at Site 3. Since Site 1 on Spring Arbor Lake is deep enough to thermally stratify and had an euphotic zone that was generally less than the total depth, low dissolved oxygen values would be expected in the bottom waters of this site.

In the absence of dissolved oxygen, undesirable substances such as hydrogen sulfide, ammonia, methane, phosphorus, iron, and manganese may accumulate in the bottom waters. When these substances are distributed throughout the lake during spring and fall mixing periods, they can trigger nuisance algal blooms, aquatic weed growth, taste and odor, and other water quality problems.

SUMMARY AND RECOMMENDATIONS

Summary

Spring Arbor Lake, a recreational impoundment in southern Illinois, was sampled on seven dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer David R. Derge recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Spring Arbor Lake (105.6 inches) ranked 2nd of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was greater than the four feet minimum recommended for swimming by the Department of Public Health, and was above average for Illinois lakes.

Significant spatial and seasonal differences were not noted in the transparency of Spring Arbor Lake. Water transparency was influenced primarily by the presence of algae.

Spring Arbor Lake is deep enough to thermally stratify during the summer. Since the lower limit of its euphotic zone (estimated at twice the Secchi depth) is generally less than the total depth, low bottom water dissolved oxygen values, associated water quality problems, and limitation of fish habitat may be expected during summer stratification.

Spring Arbor Lake is undergoing the process of eutrophication, and protection from degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Nutrient contributions from septic tanks, fertilization of lawns, and waterfowl should also be investigated and minimized.

In-lake management may also warrant consideration. Aeration-destratification to prevent dissolved oxygen depletion may promote a shift in algal populations to species other than the problem-causing blue-greens and improve fishing. Harvesting of aquatic weeds might also be considered.

Continued monitoring is recommended for Spring Arbor Lake. Consistent data gathered over a period of years is necessary to more fully document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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DS:jab/sp3873C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

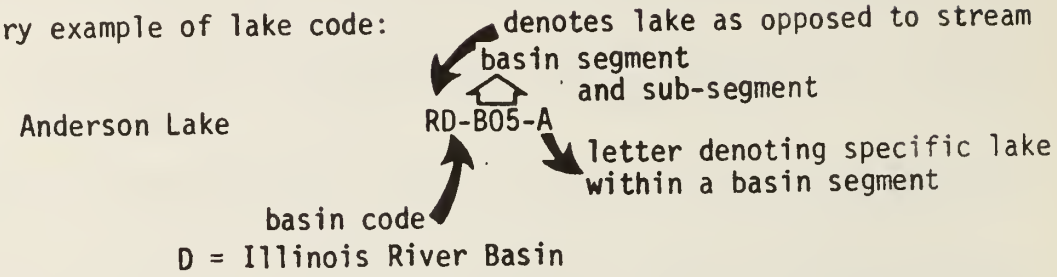
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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1981 VOLUNTEER LAKE MONITORING PROGRAM REPORT

FOR

SPRING LAKE, WINNEBAGO COUNTY, ILLINOIS

A Cooperative Citizen -
Illinois Environmental Protection Agency
Project

May, 1982
Illinois Environmental Protection Agency
2200 Churchill Road
Springfield, Illinois 62706

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INTRODUCTION

A cooperative volunteer lake monitoring effort was initiated by the Illinois EPA in 1981 as part of an overall self-help, service program being developed for lakes. In addition to expanding the Agency's lakes data base with information on present water quality and trends, the program was designed to involve citizens in learning about a lake so they could make more informed decisions regarding its use, protection, and enhancement.

Citizens selected a lake they were concerned about and were trained to measure water clarity or transparency by recording the depth to which a Secchi disc (an eight-inch diameter metal plate painted black and white in alternating quadrants) was visible. They also measured total depth and recorded field observations from a boat at three sites on their chosen lake. Readings were to be taken twice a month from May through October and reported to the Agency on special data forms. The Secchi disc, data forms, and postage paid envelopes were provided by the Agency. Volunteers were required to have a boat with an anchor to perform the monitoring.

Approximately 140 volunteers participated in monitoring 87 lakes in 1981. The sampling data were computerized to facilitate analyses and preparation of tables and graphs for reports. A statewide report entitled "Volunteer Lake Monitoring, 1981", summarized all the data for the volunteer lakes. Individual reports were also prepared for each of the 87 lakes monitored by volunteers in 1981.

BACKGROUND

Spring Lake is a 10 acre impoundment owned by the Property Owner's Association of Spring Lake Estate in Winnebago County. The lake, which was constructed by damming an unnamed creek in 1965, has a maximum depth of 12 feet, an average depth of 7 feet and a storage capacity of 69 acre-feet (Table 1).

Spring Lake serves as a recreational lake used primarily for fishing, row boating, or canoeing, sailboating and waterfowl observation. Access is available to organization members only.

The watershed drainage area of Spring Lake is estimated to be 80 percent residential. The lake shoreline is totally residential.

Algal blooms and aquatic weeds are considered moderate problems for Spring Lake. Urban storm drainage, pasture or grassland runoff, construction site runoff, fertilizer or pesticides from lawns and waterfowl are cited as major pollution sources.

Assessment and monitoring information on Spring Lake was provided by Louis J. Tisovec, M.D. Secchi disc depth, total depth and field observations were recorded at three sites (located in Fig. 1) on seven dates in 1981.

TABLE 1. LAKE ASSESSMENT SUMMARY, SPRING LAKE, WINNEBAGO COUNTY, ILLINOIS (RP-B02-N).

I. GENERAL INFORMATION

River Basin: Rock
Segment: B02

Ownership: Spring Lake Estates Property Owners Assoc.

Surface Area (Acres): 9.8'
Watershed Area (Acres):
Maximum Depth (Feet): 11-12
Average Depth (Feet): 7
Storage Capacity (Acre/Feet): 68.6
Inflowing Stream(s): none
Outflowing Stream(s): Spring Creek
Water Retention Time:
Lake Type: Dammed rainwater runoff & City water supply in summer.
Year Constructed: 1965

II. USAGE

Public Access: No-organization members & guests only.
Lake Usage:
Potable Water Supply: none
Industrial Water Supply: none
Agricultural Water Supply: none
Cooling Water: none
Recreation:
Fishing: moderate
Swimming: none
Power Boating: none
Row Boating or Canoeing: moderate
Sailboating: moderate
Camping: none
Picnicking: none
Waterfowl Hunting: none
Waterfowl Observation: moderate
Other:

Recreational Facilities:

Shoreline Usage (Percent):
Urban (Including Streets):
Residential (Including Lawns): 100%
Golf Courses:
Pasture or Grassland:
Woodland:
Row Crops:
Wetland:
Other:

Watershed Usage (Percent):
Urban: 10%
Residential: 80%
Golf Courses:
Pasture or Grassland: 10%
Woodland:
Row Crops:
Wetland:
Other:

III. WATER QUALITY AND PROBLEMS

General Water Quality: good
Fishing: fair
Conditions and Extent:
Suspended Sediment: minimal
Deposition of Sediment: minimal*
Algal Blooms: moderate
Aquatic Weeds: moderate
Taste and/or Odor: minimal
Water Level Fluctuation: minimal
Fishkills: minimal
Other:
*Inlet at N. end has silt after heavy rain.

IV. CAUSES OF WATER QUALITY PROBLEMS

Potential Pollution Sources:
Sewage Treatment Plant Effluent:
Industrial Discharge:
Urban Storm Drainage: yes
Septic Tanks:
Pasture or Grassland Runoff: yes
Cropland Runoff:
Feedlot Runoff:
Construction Site Runoff: yes
Fertilizer or Pesticides from Lawns/Golf Courses: yes
Orchards:
Forestry Operations Runoff:
Mining:
Waterfowl: yes
Sediment in Lake:
Other:

V. LAKE MANAGEMENT

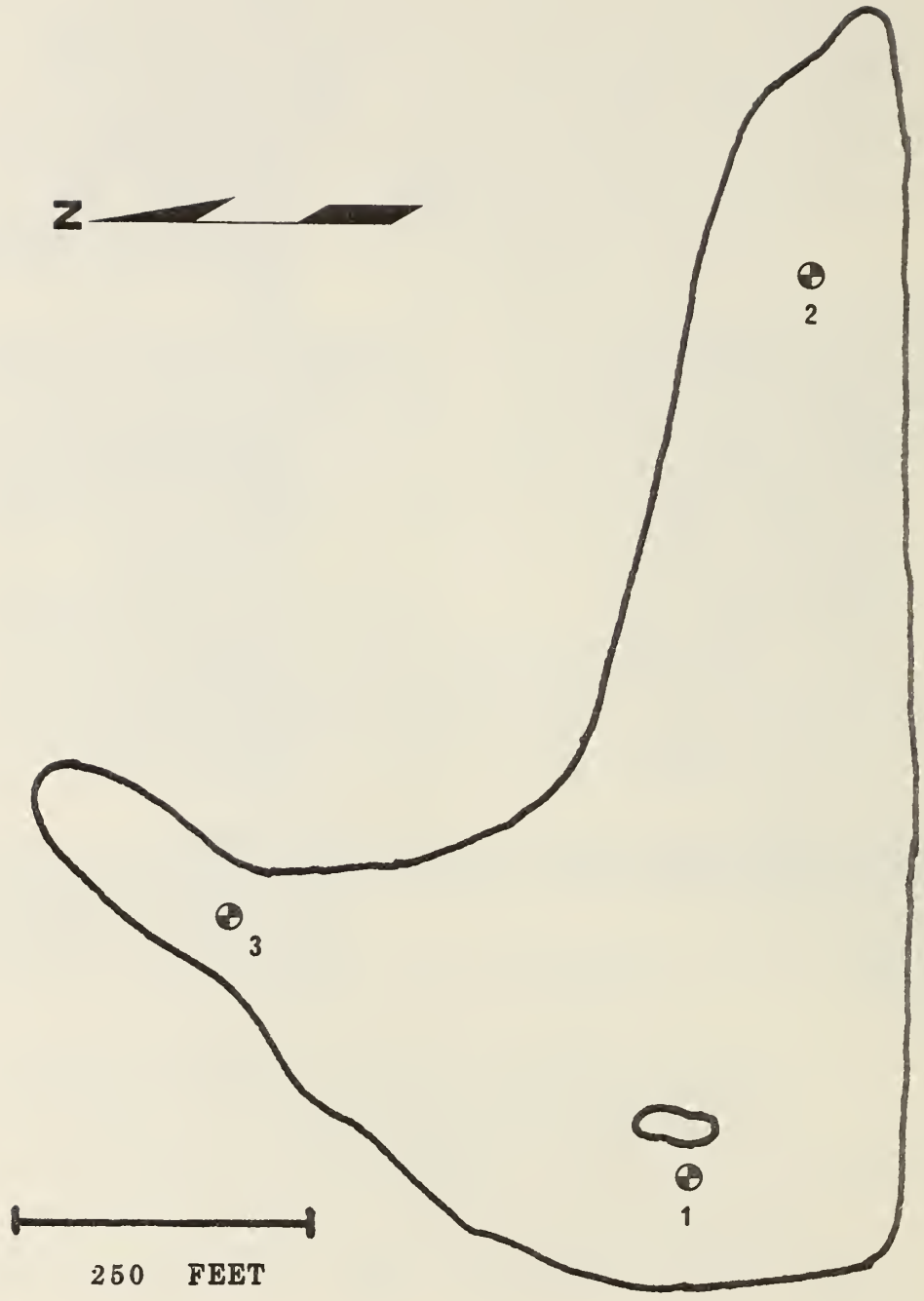
Comments: 5-30-81 300 lbs. copper sulfate; 7-11-81 - 600 lbs. copper sulfate to control algae and weeds.

*Information Supplied By L.J. Tisovec, M.D. (1981)

FIGURE 1

SPRING LAKE

WINNEBAGO COUNTY



RESULTS AND DISCUSSION

In this section, monitoring results will be presented for the lake and compared to those for other lakes in the volunteer program. Then spatial (within lake) and seasonal differences in transparency will be examined and related to field observations. Results will also be discussed in terms of lake uses. For an explanation of unfamiliar terms or concepts presented here, refer to the report "Volunteer Lake Monitoring, 1981", Section IV "Understanding Illinois' Lakes."

The Secchi monitoring data for Spring Lake are summarized in Table 2 and plotted in Figure 2. Total depth data are provided in Table 3, while field observations are summarized in Table 4.

Transparency of Spring Lake

The average Secchi disc transparency of Spring Lake was 22.1 inches, which ranked number 60 when the average transparencies of the volunteer lakes were ranked from clearest (number 1 at 137.8 inches) to least transparent (number 87 at 7.3 inches). This average transparency was less than the four feet minimum recommended for swimming by the Illinois Department of Public Health (1976) and was in the range generally associated with use impairment problems for Illinois lakes.

Spatial and Seasonal Differences in Transparency

The Secchi disc transparency of Spring Lake ranged from a minimum of 14 inches at Site 2 on May 30 and Site 3 on July 5 to a maximum of 34 inches at Site 1 on May 17. Secchi readings were below the four feet minimum recommended for swimming on all sampling dates.

Differences in clarity were evident in different sections of Spring Lake. Transparency averaged 28.6 inches, 19.7 inches, and 18.0 inches at Sites 1, 2, and 3 respectively. The lower Secchi readings at Sites 2 and 3 were probably related, in part, to their shallow depths (average depths of 5.1 feet and 5.4 feet, respectively) and resultant stirring up of sediment by wind and wave activity. It may also reflect a greater input of nutrients and sediment in the vicinity of these sites.

Since Secchi measurements were not taken in September and October, seasonal differences in the transparency of Spring Lake could not be completely described. The lake was very turbid throughout the May-August sampling, with the lowest transparencies found on July 5.

TABLE 2

SECCHI DISC TRANSPARENCY (INCHES) SPRING/WINNEBAGO COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 17	34.0	22.0	20.0	26.3	7.6
05/ 30	28.0	14.0	16.0	19.3	7.6
06/ 14	30.0	20.0	18.0	22.7	6.4
07/ 5	26.0	16.0	14.0	18.7	6.4
07/ 19	28.0	18.0	16.0	20.7	6.4
08/ 9	30.0	24.0	24.0	26.0	3.5
08/ 30	24.0	24.0	18.0	22.0	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	28.6	19.7	18.0	22.1
STD DEV	3.2	3.9	3.3	5.8
MIN	24.0	14.0	14.0	14.0
MAX	34.0	24.0	24.0	34.0
AV DEPTH	11.2	5.1	5.4	

-1 = missing value

See glossary for explanation of Summary Statistics.

TABLE 3

DEPTH OF SITE (FEET) SPRING/WINNEBAGO COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

DATE	SITE 1	SITE 2	SITE 3	MEAN	STD DEV
05/ 17	10.5	5.0	5.5	7.0	3.0
05/ 30	11.0	5.0	5.0	7.0	3.5
06/ 14	11.5	5.0	5.5	7.3	3.6
07/ 5	11.5	5.0	5.0	7.2	3.0
07/ 19	11.0	5.0	5.5	7.2	3.3
08/ 9	11.5	5.5	5.5	7.5	3.5
08/ 30	11.5	5.5	5.5	7.5	3.5

SUMMARY STATISTICS

	SITES			LAKE
MEAN	11.2	5.1	5.4	7.2
STD DEV	0.4	0.2	0.2	2.9
MIN	10.5	5.0	5.0	5.0
MAX	11.5	5.5	5.5	11.5
AV DEPTH	11.2	5.1	5.4	

-1 = missing value

See glossary for explanation of Summary Statistics.

FIGURE 2

SECCHI DISC TRANSPARENCY (INCHES) SPRING/WINNEBAGO COUNTY, ILLINOIS (VOLUNTEER DATA 1981)

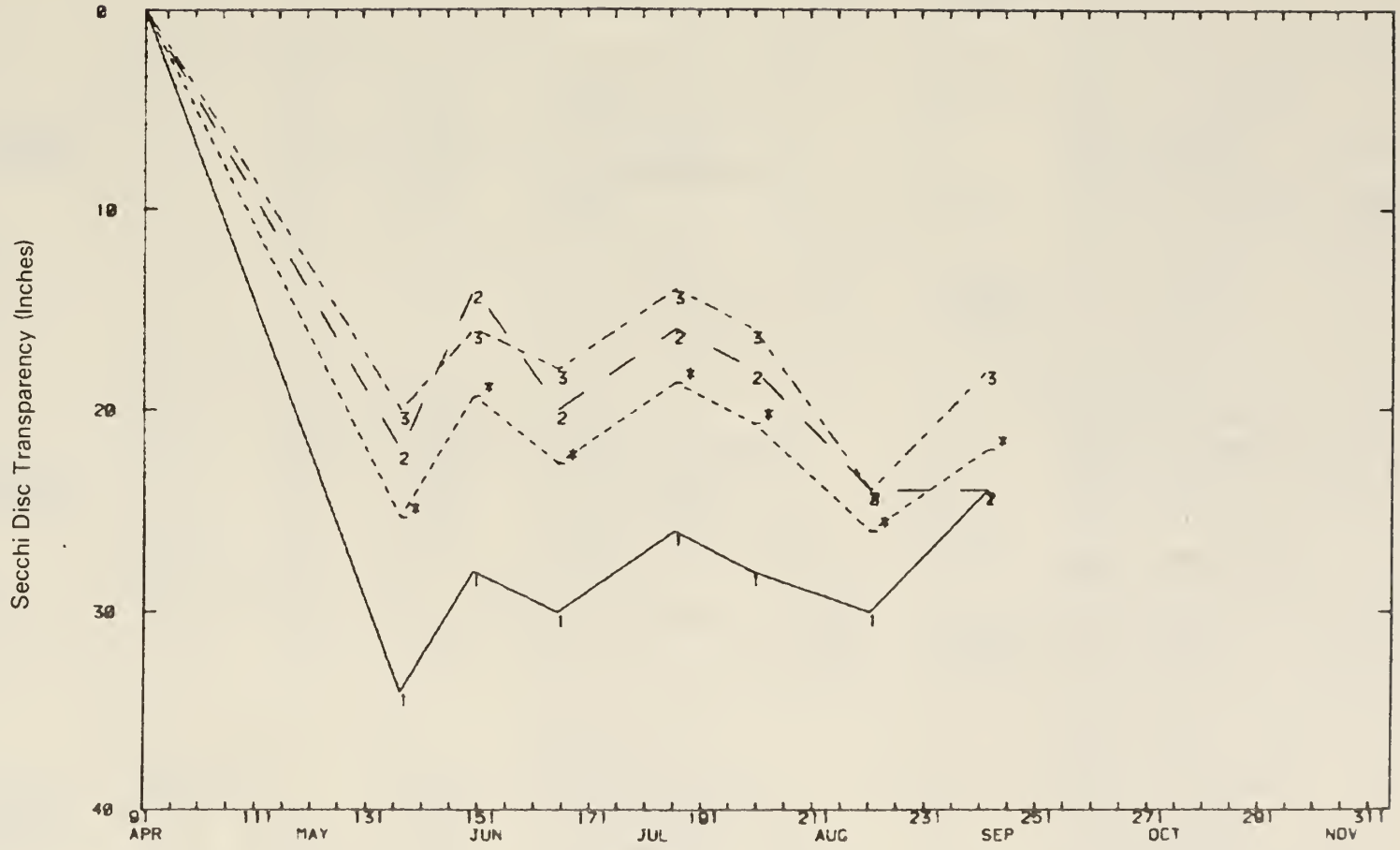


TABLE 4. FIELD OBSERVATIONS, SPRING LAKE, WINNEBAGO COUNTY, ILLINOIS.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/17/81	WATER COLOR:	lt. green	lt. green	lt. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	minimal
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal
	WEEDS NEAR SHORE:	slight	minimal	slight
	OTHER SUBSTANCES:	"clippings" waterfowl	none	refuse "clippings"
	ODOR:	no odor	no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	few clouds
PRECIPITATION:	no rain	no rain
WAVES:	calm	ripple
AIR TEMPERATURE:	cool	cool
WIND DIRECTION:	E	E

OBSERVATIONS MADE BY: L. J. Tisovec M.D.

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, row boating/canoeing

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
5/30/81	WATER COLOR:	mod. green	mod. green	mod. green
	SEDIMENT:	moderate	large	large
	ALGAE:	moderate	large	large
	WEEDS AT SAMPLE SITE:	minimal	slight	slight
	WEEDS NEAR SHORE:	slight	slight	slight
	OTHER SUBSTANCES:	* waterfowl	* waterfowl	dead fish * "clippings"
	ODOR:	musty	musty	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	overcast	few clouds
PRECIPITATION:	no rain	no rain
WAVES:	calm	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	W	NW

OBSERVATIONS MADE BY: L. J. Tisovec M.D.

OTHER COMMENTS

WATER LEVEL OF LAKE:
RECREATIONAL USAGE: none

LAKE MANAGEMENT: 5/30/81 300 lbs. copper sulfate in burlap bag

ADDITIONAL COMMENTS: (bag drug behind boat) for algae control

*algal mats, algal col.

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
6/14/81	WATER COLOR:	lt. green	clear	lt. green
	SEDIMENT:	minimal	minimal	minimal
	ALGAE:	minimal	minimal	slight
	WEEDS AT SAMPLE SITE:		minimal	moderate
	WEEDS NEAR SHORE:		slight	moderate
	OTHER SUBSTANCES:		algal mats	algal mats *
	ODOR:		no odor	no odor

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	few clouds	clear
PRECIPITATION:	no rain	no rain
WAVES:	calm	ripple
AIR TEMPERATURE:	warm	warm
WIND DIRECTION:	SW	S

OBSERVATIONS MADE BY: L. J. Tisovec M.D.

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing, swimming, row boating/canoeing, sailing

LAKE MANAGEMENT: none

ADDITIONAL COMMENTS:

*cotton wood pollen

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3
7/5/81	WATER COLOR:	lt. green	lt. green	grnsh-brn
	SEDIMENT:	moderate	moderate	moderate
	ALGAE:	slight	moderate	slight
	WEEDS AT SAMPLE SITE:	moderate	large	
	WEEDS NEAR SHORE:	large	large	
	OTHER SUBSTANCES:	algal col. waterfowl	waterfowl * algal mats	algal mats *
	ODOR:	no odor	musty	musty

WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS
CLOUD COVER:	clear	few clouds
PRECIPITATION:	no rain	no rain
WAVES:	ripple	ripple
AIR TEMPERATURE:	hot	hot
WIND DIRECTION:	S	S

OBSERVATIONS MADE BY: L. J. Tisovec M.D.

OTHER COMMENTS

WATER LEVEL OF LAKE: normal
RECREATIONAL USAGE: fishing

LAKE MANAGEMENT:

ADDITIONAL COMMENTS:

*"clippings"

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
7/19/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	many clouds	hazy	WATER LEVEL OF LAKE: normal
	SEDIMENT:	slight	slight	slight	PRECIPITATION:	v. lt. rain	no rain	RECREATIONAL USAGE: fishing, row boating/canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:	ripple	calm	
	WEEDS AT SAMPLE SITE:	minimal	moderate	moderate	AIR TEMPERATURE:	hot	hot	LAKE MANAGEMENT: 7/11/81 500 lbs. copper sulfate drug behind boat in bag.
	WEEDS NEAR SHORE:	moderate	moderate	slight	WIND DIRECTION:	S	S	ADDITIONAL COMMENTS: Entire lake treated for persistent weeds.
	OTHER SUBSTANCES:	waterfowl	waterfowl	detritus *				
	ODOR:	"clippings" no odor	"clippings" no odor	"clippings no odor	OBSERVATIONS MADE BY: L. J. Tisovec M.D.			

*sediment

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/9/81	WATER COLOR:	lt. green	lt. green	lt. green	CLOUD COVER:	hazy	hazy	WATER LEVEL OF LAKE: normal
	SEDIMENT:	slight	slight	slight	PRECIPITATION:	no rain	no rain	RECREATIONAL USAGE: fishing, row boating or canoeing
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	LAKE MANAGEMENT: none since 7/13/81
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	S	S	
	OTHER SUBSTANCES:	waterfowl	waterfowl	grass clippings				ADDITIONAL COMMENTS:
	ODOR:				OBSERVATIONS MADE BY: L.J. Tisovec M.D.			

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
8/30/81	WATER COLOR:	lt. green	mod. green	grnsh-brn.	CLOUD COVER:	overcast	many clouds	WATER LEVEL OF LAKE: normal
	SEDIMENT:	minimal	moderate	moderate	PRECIPITATION:	no rain	mod. rain	RECREATIONAL USAGE: none
	ALGAE:	minimal	minimal	minimal	WAVES:	calm	calm	
	WEEDS AT SAMPLE SITE:	minimal	minimal	minimal	AIR TEMPERATURE:	hot	hot	LAKE MANAGEMENT:
	WEEDS NEAR SHORE:	minimal	minimal	minimal	WIND DIRECTION:	SW	SW	
	OTHER SUBSTANCES:	waterfowl	detritus*	refuse*				ADDITIONAL COMMENTS:
	ODOR:	no odor	no odor	no odor	OBSERVATIONS MADE BY: L.J. Tisovec M.D.			

* grass clippings

DATE	OBSERVATION	SITE 1	SITE 2	SITE 3	WEATHER AT LAKE	PRESENT	PRECEEDING 24 HOURS	OTHER COMMENTS
	WATER COLOR:				CLOUD COVER:			WATER LEVEL OF LAKE:
	SEDIMENT:				PRECIPITATION:			RECREATIONAL USAGE:
	ALGAE:				WAVES:			
	WEEDS AT SAMPLE SITE:				AIR TEMPERATURE:			
	WEEDS NEAR SHORE:				WIND DIRECTION:			LAKE MANAGEMENT:
	OTHER SUBSTANCES:							
	ODOR:				OBSERVATIONS MADE BY:			ADDITIONAL COMMENTS:

Field observations indicate that the lack of transparency in Spring Lake was due primarily to the presence of algae. A green water color was observed throughout the sampling period, algal colonies were noted on several occasions and the lake was routinely treated with copper sulfate for algal control. Aquatic weeds were noted as abundant, particularly at Sites 2 and 3, as well as along the shore. This probably reflects the shallow nature of these areas and/or nutrient input in the vicinity.

Relationship to Lake Use

Secchi disc transparency may indicate the potential of the lake for exhibiting water quality and use impairment problems. It may also help a fisherman locate the most likely fish habitat.

Generally, from the surface to between two and five times the Secchi disc depth can be considered the euphotic (lighted) zone of the lake; in this region there is enough light to allow plants to survive and produce oxygen by photosynthesis. This is also the zone of greatest fish activity. Waters below the euphotic zone can be expected to have little or no dissolved oxygen during the summer if the lake is thermally stratified (has layers of water of different temperatures). During this stratification period, fish will probably be limited to the euphotic or aerobic (oxygenated) zone of the lake.

The lower limit of the euphotic zone of Spring Lake (estimated at twice the Secchi depth) ranged from 4.0-5.7 feet at Site 1, from 2.3-4.0 feet at Site 2, from 2.3-4.0 feet at Site 3. Since Spring Lake is so shallow, bottom waters probably remain oxygenated by mixing due to wind.

SUMMARY AND RECOMMENDATIONS

Summary

Spring Lake, a small, shallow, recreational impoundment in Winnebago County, Illinois, was sampled on seven dates between May 1 and October 31, 1981 under the Illinois EPA's Volunteer Lake Monitoring Program. Volunteer Louis Tisovek recorded Secchi disc transparency, total depth, and field observations at three sites and reported results to the Illinois EPA.

The average Secchi disc transparency of Spring Lake (22.1 inches) ranked 60th of the 87 lakes monitored by volunteers in 1981 (rank 1 is clearest; 87 is least transparent). This average transparency was less than the four feet minimum recommended for swimming by the Department of Public Health and was in the range generally associated with use impairment problems in Illinois lakes.

Spring Lake is undergoing the process of eutrophication, as evidenced by transparency readings and field observations of algae, weed, and sediment problems. Protection from further degradation is critical. If nutrient and sediment input were controlled, lake quality would probably improve; failure to control inputs will probably result in continued rapid eutrophication. Lake managers should identify sources of nutrient and sediment input and take steps to control them before the lake becomes further degraded.

Recommendations

Developing a management plan for a lake requires a comprehensive assessment of the lake and watershed and is beyond the scope of this project. However, some suggestions regarding lake management are presented below for consideration; their applicability to this lake would require further study. Alternative options not presented here may also apply.

Information on lake water levels is important for determining lake management strategies. Installation of a simple, but accurate, water level measuring device and frequent recording of lake water levels is recommended.

Lake managers should work with the Soil and Water Conservation District and the Soil Conservation Service to develop a procedure to identify and quantify non-point pollution source areas. This procedure should allow for the targeting of resources and programs to correct the identified problems.

Installation of Resource Management Systems in source areas of the watershed may reduce nutrient and sediment transport to the lake. Stabilization of the lake shoreline by riprap or some other means may also reduce sediment input. Pollutant contributions from urban storm drainage, fertilization of lawns, and waterfowl should also be investigated and minimized. Harvesting of aquatic weeds or use of screens in selected areas might also be considered.

Continued monitoring is recommended for Spring Lake. Consistent data gathered over a period of years is necessary to document and evaluate water quality trends, identify problems, and evaluate lake/watershed management strategies.

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Illinois Environmental Protection Agency. 1982. Volunteer Lake Monitoring, 1981. A Cooperative Citizen - Illinois Environmental Protection Agency project. Monitoring Unit; Division of Water Pollution Control, Illinois EPA, Springfield, Illinois.

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DS:jab/sp3873C

GLOSSARY*

acre-foot - the volume of water required to cover one acre to a depth of one foot and equal to 0.3258 million gallons; a unit of storage capacity obtained by multiplying surface area (in acres) by average depth (in feet).

aeration-destratifcation - the addition of air to the water through mechanical means to increase the dissolved oxygen content of the bottom waters of lakes by eliminating thermal stratification and homogenizing the entire water column.

aerobic - conditions characterized by the presence of oxygen.

algae - one-celled or colonial photosynthetic plants (usually microscopic), found suspended in water or attached to damp rocks or other substrates.

algal bloom - a large number of planktonic algae, which often turns the water green and may produce objectionable scums and odors; a condition in which algae cloud the water noticeably.

ambient - existing condition or level at the time and place.

ammonia - a colorless, gaseous, alkaline compound which is a decompositional end product of nitrogen-containing organic matter; its importance in fresh water is associated with its toxicity to aquatic organisms and its use as a nutrient for aquatic plant growth.

anaerobic - conditions characterized by the absence of oxygen.

anoxic - without oxygen.

aquatic - growing or living in water; pertaining to water.

aquatic weeds - larger plants easily visible to the naked eye which are submergent, floating or emergent in the water.

artificial - man-made; constructed.

average depth - mean depth of a lake, calculated by dividing the volume (storage capacity) by the surface area.

backwater (or river backwater) - water impoundment located along the side of a stream or river which may flood periodically or have a direct connection to the stream at all times.

blue-green algae - a group of one celled or colonial plants of the phylum Cyanophyta, which live in water or damp places and reflect a blue to dark green tint; most often responsible for nuisance algal blooms with scum and odors.

borrow pit - a water impoundment formed by removal of earth for fill construction in the making of roads, dikes, bridges and levees

bottomland lake - natural water impoundment located in a river floodplain

circulation period - mixing period for a lake; period of time in which the entire lake volume is not thermally stratified and is totally mixed by wind action.

condition - the overall quality of the lake for supporting general use

detritus - finely divided organic and inorganic setteable material suspended in the water

diatoms - a group of one-celled or colonial algae living in water or damp places which are characterized by the presence of yellow-green or brown pigments and cell walls which contain silica and are composed of two halves (valves), one overlapping the other like the top and bottom of a pill box

drainage area - watershed; the land surface surrounding the lake which contributes water via surface runoff to the the lake

ecology - the study of the relationship of organisms to their environment

emergent - a rooted aquatic plant with parts normally extending above the water surface

epilimnion - upper, relatively warm, circulating zone of water in a thermally stratified lake

euphotic zone - region of a lake where light penetration is sufficient to maintain photosynthesis; its lower limit is generally two to five times the Secchi disc transparency.

eutrophic - waters which are rich in plant nutrients and capable of supporting high biological productivity; USEPA defines a eutrophic lake as one that exhibits any of the following characteristics: biomass accumulations of primary producers (algal blooms and excessive aquatic weeds); rapid organic or inorganic sedimentation and shallowing; or seasonal dissolved oxygen dificiencies in the bottom waters and subsequent shift in species composition of aquatic fauna to forms that can tolerate lower concentrations of oxygen.

eutrophication - lake aging trhough nutrient enrichment and sedimentation.

fertile - waters rich in plant nutrients.

glacial lake - body of standing water formed by glacial action.

green algae - a group of one-celled or colonial plants of the phylum Chlorophyta, which live in water or damp areas and reflect a greenish tint.

hydrogen sulfide - a gaseous compound produced under anaerobic conditions which has a rotten egg smell.

hypolimnion - lower, relatively cold, noncirculating zone in a thermally stratified lake.

impairment - that which damages or negatively impacts the present or potential use of a body of water.

impoundment - a body of standing water constructed by artificial means or formed by nature.

in-lake treatment or control techniques - methods to limit the availability of pollutants already in the lake or to accelerate their outflow; and various physical, chemical and biological approaches for managing the consequences of degradation and exhancing the usability of the lake without controlling the source of the degradation.

iron - an essential micronutrient, which is considered objectionable in water supplies because it can cause taste and odor problems and stain laundry.

lake - a body of standing water 6.0 acres or more in surface area (as defined by the Illinois Department of Conservation).

lake code - an eight-digit combination of letters and numbers used to identify a lake in the computer.

limnologist - aquatic ecologist; one who studies the physical, chemical, and biological aspects of lakes.

limnology - the study of the ecology of inland lakes.

littoral - shoreward region of a body of water.

macrophyte - large plant of macroscopic size (easily visible to the naked eye).

management - non-structural measures designed to enhance the quality and usability of a lake.

manganese - an essential micronutrient, which is considered objectionable at high concentrations because it can cause taste and odor problems.

maximum (max) - highest (largest) value observed in a data set.

maximum depth - depth of deepest point in a lake.

mean - a statistical term for average, calculated by totalling the values and dividing by the number of observations.

mean depth - the volume of a lake divided by its surface area; average depth.

mesotrophic - waters intermediate in character between oligotrophic and eutrophic; moderately well supplied with plant nutrients and capable of supporting moderate biological productivity.

minimum (min) - smallest (lowest) value observed in a data set.

mixing period - circulation period of a lake; period of time in which the lake is not thermally stratified and is totally mixed by wind action.

nitrogen - an element which is an essential plant nutrient and is one of the principal elemental constituents of proteins.

nonpoint pollution - pollution from diffuse sources (e.g., agriculture, forestry operations, mining, construction) for which a specific point of discharge cannot be readily identified.

nutrient - any chemical element, ion or compound that is required by an organism for the continuation of growth, reproduction and other life processes; nitrogen and phosphorus are usually growth limiting factors for aquatic plants.

oligotrophic - waters with low concentrations of plant nutrients and hence capable of supporting little biological productivity.

organizational impoundment - body of standing water owned, leased or maintained by an organization of six or more members (as defined by the Illinois Department of Conservation).

phosphorus - an element which is an essential plant nutrient and plays a vital role in the energy transfer during cell metabolism.

photosynthesis - the process by which green plants use the sun's energy to convert dioxide and water into chemical energy (carbohydrates, fats, and proteins).

phytoplankton - microscopic plants (algae) that drift passively in open water regions of lakes and rivers.

plankton - the community of microscopic plants and animals that drift passively in open water regions of lakes and rivers.

point source pollution - pollution eminating from a discharge point such as a pipe which can be specifically identified (e.g., sewage treatment plants, manufacturing plants).

pollution - any substance which makes another unclean or impure.

pond - small body of standing water less than 6.0 acres in surface area (as defined by the Illinois Department of Conservation).

potable - of quality for drinking.

private impoundment - body of standing water privately owned or leased with no fee charged for use (as defined by the Illinois Department of Conservation).

production - total amount of living matter produced in a lake per unit time.

productivity - rate at which organic material (and energy) is produced and transferred through organisms in an ecosystem; standing crop of organisms that can be supported.

protection - pollution abatement or control; measures to prevent pollution from entering a lake, including methods to stop the pollution at its source or to treat it before it reaches the lake.

public access - publicly owned contiguous land or easements providing any member of the public the same or equivalent opportunity to enjoy priviledges and benefits of the lake as any other member of the public or as any resident around the lake.

public impoundment - body of standing water owned and maintained by a governmental agency (excluding the Illinois Department of Conservation) that have public access.

public water supply - used as a municipal water supply for domestic needs.

Resource Management Systems - best management practices for the control and abatement of nonpoint pollution; a combination of agricultural practices which reduce soil erosion and/or increase water retention.

restoration - structural measures designed to return a lake to its original condition (e.g., dredging to original depth).

reservoir - a watershed impoundment artificially constructed by damming of a stream.

resuspend - cause to be suspended in the water.

river basin - drainage area for a large river.

seasonal - over a period of time (seasonal).

Secchi disc - an eight-inch diameter weighted metal plate painted black and white in alternating quadrants which is lowered into the water on a calibrated line to measure the transparency or clarity of the water.

Secchi disc depth - the depth into the water to which a black and white circular disc can be seen when viewed from the surface; a measure of water transparency or its ability to allow vertical light penetration.

sediment - the solid materials (particulate matter) transported by, suspended in or deposited from, water; includes fragmentary material that originates from weathering of rock, chemical and biochemical precipitants and decomposed organic material such as humus.

sediment-related turbidity - muddiness; cloudiness or opaqueness of the water caused by suspended sediment.

sedimentation - deposition of organic and/or inorganic particulate matter.

sedimentation surveys - measurement of the amount of sediment deposited in a water body.

segments - a subwatershed within a large river basin.

spatial - differences over an area.

standard deviation (Std. Dev.) - a statistical term to describe the variability of the data around the mean (average); if the magnitude of the standard deviation is "small" relative to the mean, then most of the values are close to the mean in magnitude and the data has little variability (is relative uniform); if the standard deviation is large in magnitude relative to the mean, then the data is more variable.

state impoundment - a body of standing water owned or leased and maintained by the Illinois Department of Conservation.

storage capacity - volume of water an impoundment can hold; often expressed in acre-feet, million gallons, and cubic meters.

submergent - an aquatic plant that lives and grows entirely below the surface of the water.

succession - in ecology, the progressive change of plant and animal life in an area.

suspended sediment - the sediment that at any given time is maintained in suspension by current or as a colloid.

suspended solids - particulate material that at any given time is maintained in suspension by current or as a colloid; total suspended solids are all suspended particular material, volatile and non-volatile, organic and inorganic; volatile suspended solids is that suspended particulate material, generally organic in nature, which undergoes combustion at a temperature of 600°C.

suspension - a heterogenous mixture in which the particles of one substance are kept dispersed by agitation.

thermal stratification - the layering of the water in a lake due to different densities as a function of temperature; the layers are the epilimnion (upper), metalimnion or thermocline (middle), and the hypolimnion (lower).

thermocline - metalimnion; the middle layer of water in a thermally stratified lake in which temperature decreases rapidly with increasing depth.

transparency - ability to allow light penetration and be seen through; clarity.

trophic state - the degree of eutrophication of a lake; the rate of primary biological production it is capable of supporting.

turbid - cloudy, opaque, murky, dirty-looking; containing suspensoids (organic or inorganic) which interfere with light penetration.

turbidity - amount of scattering of light caused by material suspended in the water.

use impairment - that which damages or negatively impacts the present or potential use of a body of water.

water quality - the suitability of the water for supporting various uses.

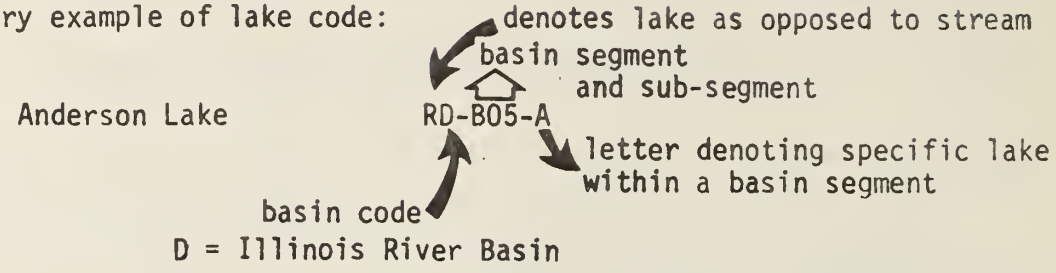
water retention time - water residence time; period of time a mass of water remains in an impoundment.

watershed - drainage area; the land surface surrounding the lake which contributes water, via surface runoff, to the lake; the total or contributing watershed area is the total draining to the lake, including the lake surface area; the immediate or net watershed is the portion of the total watershed (free of lakes or sloughs) from which direct, unimpeded surficial runoff drains to the lake.

zooplankton - animal portion of the community of suspended or floating organisms which drift passively with the water currents.

av - average
brn - brown
brnsh-grn - brownish-green
grn-brn - green-brown
grnsh-brn - greenish-brown
lt - light
max - maximum value
min - minimum value
mod - moderately
std. dev. - standard deviation
v - very

Explanatory example of lake code:



*Definitions of items in sense used in text

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